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Vol. V. NEW YORK, MAY 16, 1885. No. 20.

*Handsomely bound volumes of* THE ELECTRICAL WORLD *for* 1884 *are now ready, and will be sent, charges prepaid, to any address on receipt of* $5.00.

OUR recent remarks on the increase of business in the Patent Office are confirmed by the statement just issued that during April the office did the largest amount of work ever transacted by it in a month. The fees aggregated over $100,000. We should take more pleasure in recording the collection of this great sum of money if we knew that it was to be legitimately employed for the benefit of the class of men from whose light pockets it came.

IN our report of the argument on telephone affairs before the Massachusetts Legislative Committee on Mercantile Affairs will be found an interesting discussion as to the extent to which the patent laws secure an inventor and patentee from State legislation adverse to his interests, and the extent to which a legislature can interpose between two of the corporations it has created and replace the contract between them by terms of its own selection.

SOME time ago a special concession was made by China to Denmark in the shape of the telegraphic convention between Li Hung Chang and the Great Northern Telegraph Company. Now, however, Denmark has taken the French view with regard to treating rice as a contraband of war, and it is hinted that the convention may not be ratified after all. This would be an unkind cut for the little kingdom, which cares a good deal more about cables than it does about rice.

THE result of the experiment at Lockport, N. Y., where Edison lamps are being used for street lighting, is awaited with considerable interest. It will be remembered that a similar test on the Holborn viaduct, in London, has been a success down to date. Another European Edison plant, running several street lamps, is that at Bellgarde-sur-Valserine, where 16 candle-power lamps are used. Every step in the direction of lessening the size of the mains must, of course, render the incandescent lamp applicable to the lighting of large areas, and on circuits of considerable length.

MAY movings have been less frequent this year than usual. The most notable is by all odds that of the American electric lighting interests from Boston to New York, the officers recognizing the superior advantages of this city for business purposes. We are glad to have the American Company here, and have no doubt it will find this latest not the least happy of its "moves." The company has had good training in Boston, and comes here rich in experience, ability and backing. We may now expect to see the American Bell Company moving on New York. Its friends and those of its own household are doing their best to send it here by their zealous efforts to legislate in its behalf.

IF the estimate of fond Chicago mothers is to be taken, the reputation of telegraph messenger boys is not very much of a "bubble," but a solid, tangible, valuable thing. Willie Heine is a messenger boy in Chicago, and delivered a telegram at the office of a firm of founders. On leaving the office he was followed and charged with having stolen a package of money from it. He denied the charge with indignation, but was again pressed to make a clean breast of it at the telegraph office. He renewed his denial stoutly, and before long word came that it was "all right," as the money had been found. Willie's mother does not think it all right, and has sued the two members of the firm for $20,000 each for the damage to her son's reputation. The rating is rather high, and might not be accepted as readily in New York as in Chicago, but we hope that Willie's wounded feelings will be substantially soothed.

THE efforts of the people of New York and Brooklyn to obtain cheap and good gas are likely to meet with some measure of success, the Assembly having now passed a bill fixing the maximum price of gas at $1.50 per 1,000 feet. It is possible that this may secure the desired effect, but by supplying a bad article at high pressure, the gas companies could easily indemnify themselves. The bill as adopted is simply a measure of relief, the provisions with reference to a gas inspector and a meter inspector being stricken out. The subject is, of course, one of great interest to electric light people, some of whom dread cheap gas. Our own idea is that the more the eye is educated up to a high standard of good illumination the better the chances of electric lighting become. Besides, cheap gas is an inducement to run small incandescent plants with gas engines, the "poison," as Mr. Preece calls it, being thereby kept outside the living apartments, while all the advantages of a pure and brilliant light by means of electricity are secured.

IT is announced that the annual meeting of the American Institute of Electrical Engineers, for the election of officers to serve during 1885–6, and for the transaction of other important business, will be held at the House of the American Society of Civil Engineers, 127 East Twenty-third street, this city, on Tuesday, the 19th inst., at 8 P. M. The first general meeting of the new year, for the reading of papers and discussion thereon, will begin the next day, at 10 A. M., at the same place, when some interesting papers will be submitted. A collation will be provided between the morning and afternoon sessions, and there is no doubt that the day will be spent enjoyably and profitably. Several distinguished guests are expected, and both meetings will be open to visitors introduced by members or associates. The Institute has made a good record during its first year, and will, we trust, prosper greatly in the years to come. No limits can be assigned to the usefulness of a society of this character, and we would urge all our readers, who are not yet enrolled, to join it.

WE have been at considerable trouble to give our readers this week a definite idea as to the main issues in the suits brought by Mr. Edison's representatives in defense of his patents. The suits brought against the United States Company and those using its lights are the most important, and the points raised in them are generally the same as those raised in the others. We have, therefore, gone carefully over that ground, and in order to deal equitably with both sides have given the gist of the counter suit of the United States Company against the Edison Company. Thus, all who are interested in the subject will be assisted in forming a clear conception of the case. It is, of course, far too early to fix a time for the settlement of the matter. We believe the answers are not returnable until July, and of course where there is such an array of counsel and experts as suits of this important nature always require, years may be exhausted before a decision is arrived at. The Bell-Drawbaugh case will be fresh in the minds of many, as will also the Brush-Weston suits, brought to an end last year, though begun as far back as December, 1880. Still, where the interests at stake are so large, and where the future of the industry itself is concerned, one can but hope for a speedy decision.

MR. GEORGE MANN, a correspondent of the *American Miller*, favors that journal with a most remarkable letter on electricity in flour mills. In explaining the frequent fires in mills, he says they are due to electricity generated by the machinery, and he proposes to carry off the electricity by copper wires running from the machinery to ground outside the mill. Then all will be safe. He says of thunderstorms that lightning ignites the dust stirred up by the wind, and that the wind increases in force on account of the lightning flashes. We do not quite follow him in this explanation, but we are more mystified when we come to the esoteric statement that "the backbone of this terrible energy is partly frictional, as well as atmospheric." Mr. Mann also remarks sententiously that "motion is the sequence of power more or less expended, and cannot be obtained without frictional contact." The idea that fires in mills are due sometimes to electricity is not new, and the proposal to draw off the currents as generated is familiar, but there is much that is new in Mr. Mann's phallic philosophy on a subject which, as he says, is "of no ordinary interest and one that is fraught with danger." It should be recorded, however, that Mr. Mann has submitted his plan to a "practical expert electrician," who "pronounces it all right, and says it will work well." The millers of America are in his debt.

THE Inventions Exhibition in London is now open, and is attracting a good many visitors. The electric lighting arrangements are on a grand scale, as we have already noted. Our contemporary, *Engineering*, publishes an admirable double number devoted to the Exhibition, and pays considerable attention to the electric lights on view or in use. It says: "The number of striking novelties, however, is not great. * * * Once it was the aim of each manufacture to produce something entirely different from anybody else, so that he might have a system to which he could affix his own name, and offer in the market as entirely new and original. Now it seems to be the object of the various makers to approximate as closely as possible to one end, to combine in their apparatus all the features that experience has shown to be valuable. * * * The competition now is for customers to buy apparatus, and not for investors to purchase patents." We have not got to that point exactly in this country yet, but there is no doubt that electric lighting has settled down to a commercial basis; and that very few patents for lamps or machines will be sold hereafter on the strength of great originality or special merit. We are glad to see that the inventions of Edison, Brush, Weston, Thomson, Hochhausen and other Americans take a prominent place at South Kensington this year, as exemplars of the progress made "in applying the discoveries of science to the purposes of daily life."

SOME time ago we published an article on the working of the telephone exchange in Brooklyn. The article was reprinted in full by the London *Electrical Review*, and drew forth some sneers at the exchange from a writer who signs "Denshin," and who assumes that in describing a model exchange in Brooklyn the author was ignorant of the multiple switch-board and its advantages, and that the apparatus in Brooklyn was of the most improved pattern. The Brooklyn office is equipped with one of the first and simplest switch-boards introduced, known as the Western Electric Standard. It is the comparatively small number of operators in proportion to the number of subscribers and amount of business, together with the admirable discipline maintained, that justifies its being called a model exchange. In regard to lightning arresters, it is an error to suppose that subscribers' instruments are not protected. They have the usual protectors furnished by the manufacturers. At the central office no lightning arresters are in use. Five years' experience in Philadelphia and Brooklyn show that no annunciators have been burned in the large offices, although the lightning is very severe every summer at both places. In the smaller or branch offices, where the number of wires is limited, the usual lightning arresters are always put in; but in spite of this the annunciators at these places are damaged by lightning more or less every summer. "Denshin" confuses "faults" with "misconnections," or failures to connect, and has the hardihood to complain that the average cost per message was not figured out on the single day's business referred to in our article.

## REVIEWS OF NEW BOOKS.

MODERN ELECTRICITY AND MAGNETISM, theoretically and practically considered, being the chapter on electricity from *The Elements of Natural Philosophy*, by Elroy M. Avery, Ph. D. 192 pages. 12mo. Price 75c.

This excellent treatise is the new sixth chapter of Dr. Avery's standard work above named, which has been revised for the forthcoming edition. To many of our readers the author is probably known as the energetic and skillful advocate of the merits of the Brush electric light system; but if they will read this book they will find him not less able and successful with his pen than with his tongue.

Dr. Avery is quick to recognize the general interest in electricity, and to see that people desire to know something about the principles involved in practical applications, as well as those that are mainly susceptible of exemplification in the laboratory. He seeks to avoid describing phenomena only because they are interesting and remarkable in themselves, his aim being to find the underlying principle throughout, so that they who study the subject by means of his book, whether impelled by curiosity or by business ties, or by the earnest desire for broader information, may form intelligent ideas about telegraphy, telephony, electric lighting, the transmission of power, secondary batteries, cables, and a variety of other subjects. The theoretical part of the science is at the same time fully considered.

The work is illustrated by more than 130 cuts, and the paragraphs are named and numbered. The "chapter" is subdivided into appropriate sections, and at the end of each are questions to test the extent to which the pupil or adult reader has understood the subject treated or can make the experiment suggested. We can cordially recommend this admirable manual to all engaged in the work of instruction, or who seek to inform themselves about the science as it exists to-day and is applied. The book is neatly bound in cloth, and has rubricated edges.

AMERICAN ELECTRICAL DIRECTORY FOR 1885; being a Complete Hand-Book of Reference of the Electric Light and Telephone Interests of North America. Compiled by E. J. & W. H. O'Beirne. Star Iron Tower Company, Fort Wayne, Ind. 382 pp. Price $1.50.

The book which bears the above title has just reached us, and shows commendable enterprise on the part of its publishers. They have put together in convenient form a large amount of valuable information regarding the commercial development of electrical enterprises. Within its covers are to be found a list of electrical patents issued in 1884, arranged alphabetically by title of invention; the names of electricians, and the titles and locations of telegraph, telephone and electric light companies, with the names of their officers and some statistics of the plants. Space is also devoted to mention of dealers in electrical supplies; isolated plants, both arc and incandescent, and an appendix gives a brief history of the electric light. The work is not free from mistakes, but deserves praise for the excellent result obtained in spite of the drawbacks attending the undertaking, and will, no doubt, be welcomed by those for whose benefit it was prepared.

## Depositing Nickel upon Zinc.

BY H. B. SLATER.

To those interested in the electro deposition of nickel upon zinc, the formula given below for a solution and a brief explanation of its use will be of service.

The first sample of this solution was made as an experiment to see what substances could be added to a solution of the double sulphate of nickel and ammonium without spoiling it.

In addition to several other combinations and mixtures of solutions from which I succeeded in obtaining a good deposit, I found that the solution here given would plate almost anything I put into it, and worked especially well upon zinc. In its use no "scraping" or rescouring or any of the many operations which I have seen recommended for zinc need be resorted to, as the metal "strikes" at once and is deposited in a continuous adherent film of reguline metal, and can be laid on as heavily as nickel is deposited generally.

I believe that the addition of the ammonium chloride simply reduces the resistance of the double sulphate solution, but the office of the potassium chloride is not so easily explained. At least, I have never been able to explain it satisfactorily to myself. It is certain, however, that the solution does not work as well without it, nor does the addition of ammonium chloride in its stead give as fine a result.

Some care is necessary in the management of the current, which should have a density of about 17 ampères per square foot of surface—not much above or below. This may seem a high figure, especially when it is discovered that there is a considerable evolution of gas during the operation.

I have repeatedly used this solution for coating articles of zinc, and always with good success. I have exhibited samples of zinc plated in this solution to those conversant with the deposition of nickel, and they have expressed surprise at the appearance of the work. Some strips of sheet-zinc in my possession have been bent and cut into every conceivable shape without a sign of fracture or curling up at the edges of the nickel coating.

The solution is composed of—

| | |
|---|---|
| Double sulphate of nickel and ammonium | 10 ounces. |
| Ammonium chloride | 4 " |
| Potassium chloride | 2 " |
| Distilled water | 1 gallon. |

The salts are dissolved in the water (hot) and the solution is worked at the ordinary temperature, about 16 degrees C.

The zinc may be cleansed in any suitable manner, but must be perfectly clean, of course, and finally rinsed in clean cold water and placed in the bath as quickly as possible; care being taken that it is connected before it touches the solution.

[Mr. Slater sends us a small but admirable specimen. Some pieces of his work in this direction had already been seen in the office of THE ELECTRICAL WORLD. The last sample is a cutting from a piece of about ½ square foot surface, buffed on one side only. The edges (cut) are intact as to the nickel, and there are no blisters.—EDS. ELECTRICAL WORLD.]

## The "Lever" Electric Arc Lamp.

Among the various arc lamps which have obtained practical application in Great Britain, the Lever arc lamp takes a prominent place. This lamp is the invention of Mr.

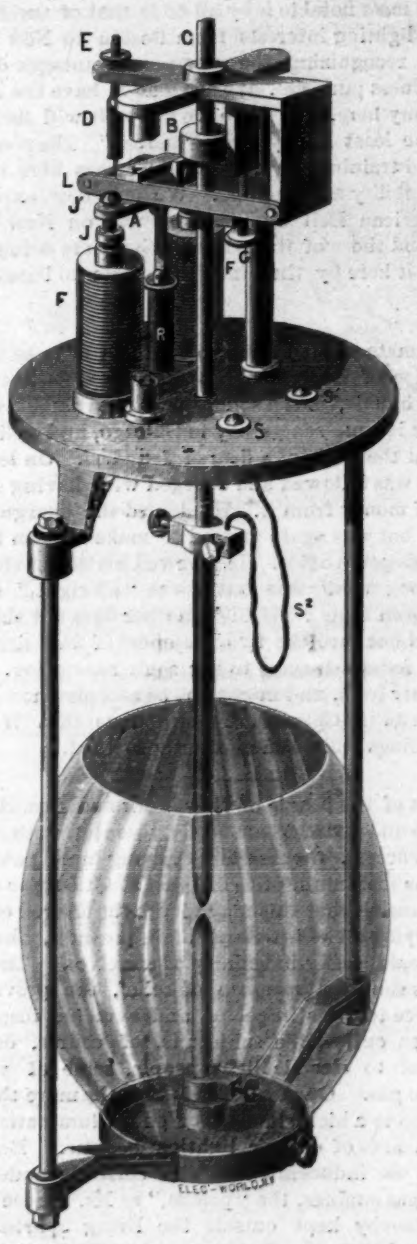



FIG. 1.—THE "LEVER" LAMP.

Charles Lever, of Bowdon, Cheshire, England, and possesses a number of novel and interesting points.

In the general view of the complete lamp, Fig. 1, *A* is

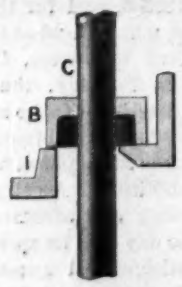



FIG. 2.—CLUTCH OF LAMP.

the armature, *L* a lever, and *D* a spring; *E* is the nut for adjusting the tension of the spring *D*, and *I* is a projection attached to the lever *L*, which cants or tilts the clip *B*, by means of spring *D*. *G* is the set screw for adjusting the length of arc. The iron screws *J J*, with large heads passing through the armature *A*, serve as adjustable pole-pieces, and can be secured by means of lock-nuts $J^1$ $J^1$. *R* is the dash-pot, and *S* $S^1$ are the binding screws. The current entering at the positive binding screw *S* passes through the insulated flexible wire or cable $S^2$, to the upper carbon holder *C*, from thence through the arc and lower carbon, and through the frame of the lamp to negative binding screw $S^1$. The side rods are insulated from each other, and the ends of the coils of the electro-magnets *F F* are connected to the binding screws *S* $S^1$, thus placing the electro-magnet *F* in derivation from the arc.

When the lamp is ready for action, the carbon points are separated by means of the spring acting on the armature lever. The current must, therefore, necessarily take effect upon the electro-magnet, which, becoming powerfully magnetic, overcomes the force of the spring, thus loosening the clip and allowing the upper carbon to fall by gravity into contact with the lower one. As soon as this occurs and the main circuit is completed, the spring overpowers the weakened magnetism of the electro-magnet, whereupon the spring again pulls up the lever, and with it the carbon rod, thus forming the arc. This action takes place almost instantaneously. When the carbons burn away the distance between them becomes greater, or, in other words, the resistance in the main circuit is increased. This causes more current to pass through the shunt electro-magnet, which, becoming stronger, again attracts the armature and lowers the carbon rod. In practice it is found that there is scarcely any perceptible motion of the lever when the arc is burning; for the shunt electro-magnet and the spring acting on the lever in opposite directions to each other, make a perfect balance, or, in other words, establish an equilibrium resulting in a steady and regular light.

It is this balancing of the antagonistic forces of the spring and the shunt electro-magnet on the lever, and causing it to alter the position of the carbon points by means of the metal collar, which constitutes one of the peculiarities of the "Lever" lamp.

A cross-section of the clutch is shown in Fig. 2, from which it will be seen that the clutch is simply a hollow metal collar surrounding the carbon-holding tube *C*. This form of clutch has been found to work very well. One of the difficulties which has hitherto attended the use of arc lamps on the shunt principle was that a special class of dynamo machine was required to work the lamps, but this has been entirely removed. It will be noticed that when the lamps are first put in action their carbons are all separated, and consequently the only path for the current is through the whole of the shunt coils in succession. These have of necessity a high resistance, and consequently the dynamo machine, unless it be shunt wound, cannot generate a current of sufficient intensity to excite its field magnets or those in the lamp. To obviate this difficulty, Mr. Lever has devised an automatic apparatus, which has the effect of short circuiting the generator through a shunt of moderate resistance, until the current has attained a determined intensity. The shunt circuit is then broken, and the full force of the current thrown into the lamps, with the effect of instantly exciting their magnets and establishing the arcs.

Mr. Lever has also devised another arrangement for enabling his lamps to be worked from series wound machines. This consists in inserting a resistance in each lamp slightly in excess of the resistance of the normal arc.

With this arrangement also, the failure of the carbons to feed causes the circuit to be momentarily broken, whereupon the lamp will cut itself out, so as not to interfere with the other lamps on the circuit.

The Lever lamp was first exhibited at the Crystal Palace Electric and Gas Exhibition, in London, in 1882, since which time it has been improved and has taken the form shown in our engravings. It is patented in this country.

## Watches and Magnetism.

BY C. K. GILES.

It is undoubtedly a fact that electricity and magnetism have more to do with the "queer freaks" and "erratic behavior" of watches than any other two causes combined. The balance-wheel and hair-spring are the vital parts attacked. The balance being made mostly of steel and exquisitely poised, and adjusted to make its vibrations with the least possible friction, is very like the needle of a galvanometer, or a fine compass, and is affected by all the electric and magnetic conditions of the wearer, just as the galvanometer or compass would be, if electric currents or magnetic conditions were brought to bear.

It is impossible to polish and finish the fine steel parts of the watch without causing a certain amount of "frictional electricity," and consequent magnetic condition; there will remain a "residual force of magnetism," the molecular atoms of the steel will be in a "tonic state," which will render these delicate parts particularly susceptible to the electric influence, either personal, mechanical or atmospherical.

The earth's magnetism, or "induced charge of earth's magnetic force," will cause any nicely adjusted watch to vary in different positions, as the vibrating balance crosses the lines of the earth's magnetic force at different angles, as when rated "pendant north," "pendant east," etc.

The electric conditions of numerous persons are such that it is impossible to regulate a watch in their pocket. They seem to be a sort of walking "storage battery," ready to "discharge" when they touch anything which is a better conductor than their own persons, as noted when gas is lighted by their finger tip, or by the electric spark and the stinging sensation in touching face or hand of another person in very cold weather. Everything about them

seems to be "electrified," and any article of iron or steel carried upon their persons will become magnetized.

Instances have been known where such a person could not carry a watch but a short time without having it become fully magnetized and worthless as a time keeper.

The parts of a watch on which we rely for adjustment are necessarily made of steel. The balance-wheel has parts which when magnetized form a good horseshoe magnet, and the hair-spring is so delicate and fine that it usually has several sections of north or south polarized within the coil, and it is so finely tempered that these magnetic sections are very sharp when once magnetized.

The "fork" is of polished steel, with several ends for the force to take possession of, and the regulator, screws, pinions, winding wheel, main-spring, etc., all make a fine resting-place for this subtle force; but the balance and hair-spring are the mischievous points for magnetism.

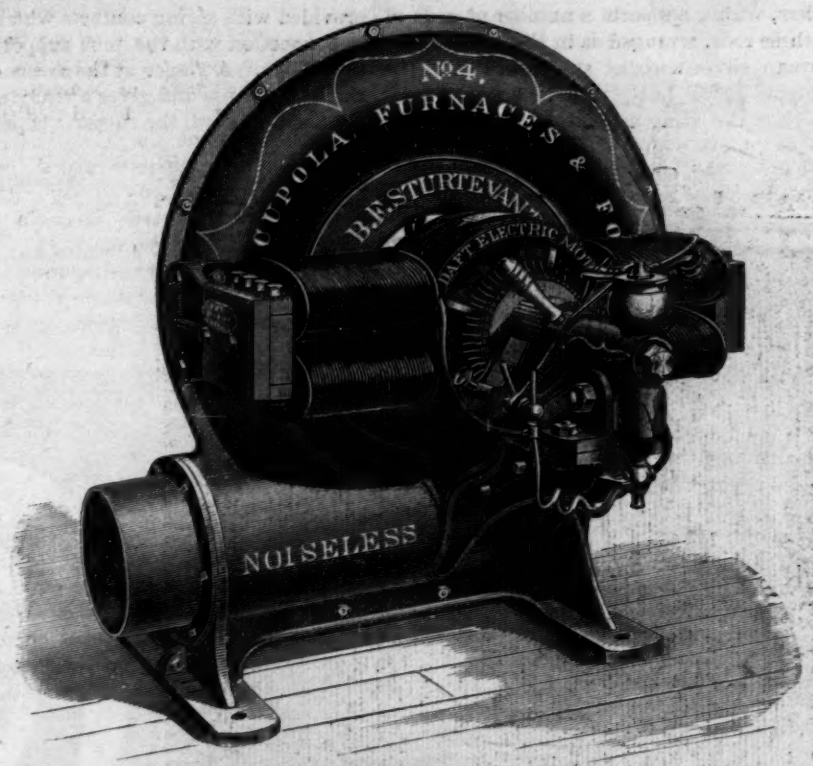



FIG. 1.—DAFT MOTOR WITH BLOWER.

When once under a magnetic condition, the balance has the same tendency to stand north and south as a compass needle, and is attracted in every direction by the different pieces of steel in proximity. The hair-spring refuses to do its work, its coils clinging together or to the balance wheel, and the watch stops, or if it runs at all, will be utterly unreliable.

To show how small an influence is necessary to bring to bear on the balance and hair-spring to make considerable variation in time, take the following figures: an ordinary watch beats five times a second, 300 times a minute, 18,000 times an hour, 432,000 times a day. Now if each of these vibrations varies $\frac{1}{86000}$ part, it will make one second in time, and if $\frac{1}{1000}$ variation, it will make 1¼ minutes per day.

It has not been found practicable to substitute other metals for the steel parts of a watch, although the field has been thoroughly tested by experimenters. Some substitutes have been used, but they have proved too expensive to become popular.

The only effective protection for a watch against magnetism, so far discovered, is the "anti-magnetic shield" described in THE ELECTRICAL WORLD of Feb. 7, 1885.

It surrounds the watch movement on all sides as nearly in a globe form as may be (or more accurately, perhaps, the movement is placed in a sort of cup).

This is constructed of decarbonized steel, pure copper and gold, so arranged as to accomplish the results required. Watches protected by this device have been subjected to severe tests, and they tick along regularly in a field of magnetic force which would stop and ruin any watch not so protected.

The cuts then used represent an anti-magnetic shield, made of size and form to surround a watch movement, placed on a horseshoe magnet about six inches long and quite powerful. A piece of card-board, two or three inches square (a large size jewelry card is convenient for this experiment), is placed on the shield; some fine soft iron filings are scattered over the card outside the shield. If the card be now gently tapped with a pencil, the filings immediately move and arrange themselves in the lines of magnetic force, showing distinctly the neutral centre in which the watch movement is placed.

If the shield is removed and the card held in the same position as before and jarred a little, the filings will move in a line between the poles of the magnet, which is the line of greatest force.

The application of this device to pocket time-pieces promises to be of very great importance to horologists and electricians. It will render operative the fine adjustments and mechanisms which hitherto have been almost hopeless and useless on account of their susceptibility to the all-pervading magnetic influence.

## Power from Central Stations.

The interest excited in the distribution of power electrically from central stations and the use of electric motors on the elevated railroads has spread so much that even the daily papers go into the subject and attempt to explain by rough illustrations the devices to be employed. The success which has attended the electric power central stations already in existence attests the appreciation in which such a convenient source of supply is held, and we hope shortly to chronicle a large increase in the number of such stations. There can be no doubt that as regards convenience and applicability, electric transmission stands unexcelled, requiring merely the leading in of wires and the placing of the motor which, revolving at a high rate of speed, can also be geared down to slow speed—a valuable feature.

Our illustration, Fig. 2, represents a generator of the Daft type, to be placed in central stations. It is capable of delivering a current of 300 ampères at 124 volts, or about 50 horse-power, the regulation being entirely automatic.

Fig. 1 shows a motor attached to a No. 4 Sturtevant blower, the two together forming practically one machine. Here, again, the high speed of the motor shows its value, but it has also a regulating switch, which allows the speed to be changed to any desired extent. Thus, in the blower shown, which requires 2 horse-power, three speeds are obtained—of 800, 2,000 and 2,700 revolutions per minute. This is accomplished by changing the resistance of the field, thus doing away with outside resistances and entailing no loss of work due to their employment. For ventilating purposes in theatres, foundries and other places where noxious gases or vapors rapidly accumulate, such a blower, with its motor, placed in the roof would go far toward remedying the inconvenience experienced from the vitiation and contamination of the atmosphere.

As we have made special reference to electric railways, and as Mr. Daft has already done much in this direction, it is interesting to know what the estimated cost is of a plant on the Daft system. In a pamphlet just issued by the Safety Electric Power Company, of this city, the following figures are given for the distribution of 500 horse power, nominal radius of 2½ miles:

| | |
|---|---|
| 2 250 horse-power engines | $10,000.00 |
| 5 100 " boilers | 6,000.00 |
| Foundations, placing, etc | 2,500.00 |
| 8 dynamos, aggregating 500 horse-power | 20,000.00 |
| Line (approximate) | 10,000.00 |
| Receivers | 35,000.00 |
| Switches, etc | 2,000.00 |
| | $85,500.00 |

*Running Expenses per Diem.*

| | |
|---|---|
| Rent of premises | 4.00 |
| Coal (8 tons) | 30.00 |
| Engineers | 6.00 |
| Linemen | 5.00 |
| 2 firemen | 4.00 |
| Station dynamo men | 4.00 |
| Outside receiver men | 14.00 |
| 10 per cent. depreciation | 23.00 |
| Oil, waste, etc | 5.00 |
| Per diem | $95.00 |

It is assumed that 350 horse-power will be ready for delivery at any moment, and following the ordinary practice of power producers, at least 600 horse-power can be rented therefrom to small consumers, limiting the delivery to, say, 10 horse-power for any one consumer; in this way an average of $150 per horse-power per annum may be realized in New York City, which would therefore return as follows:

| | |
|---|---|
| 600 horse-power at $150 per annum | $90,000.00 |
| Deduct running expenses | 35,000.00 |
| Leaving a net income of | $55,000.00 |

or 65 per cent. per annum on prime cost.

The estimate of running expenses is probably excessive, since 365 days of working expenses have been provided for, whereas this would in practice probably be reduced to 313 days, thus reducing the expenses to about $30,000 per annum and increasing the earnings to $60,000, or 70 per cent. upon the prime cost.

These are interesting figures. The plant for a ten-mile section of street car lines, on the assumption that fifty cars are to be run and that 150 horse-power is ready for delivery on the track at all times, is $62,000. Fifty loaded cars may be moving at the same time. Assuming a run of sixteen hours per day per car, the expenses are put at $49, or less than $1 per car, whereas the care and maintenance of 400 horses, which cost originally $50,000, is put at $286.87 per day, or more than $5 per car. Even should the figures be raised in the first case and lowered in the second, the advantages of electricity appear to be enormous.

The company named above, of 41 and 43 Wall street, has recently secured important territorial rights from the Daft Company, and is now undertaking to equip lines of railway as well as to make other electrical power installations of the most varied character.

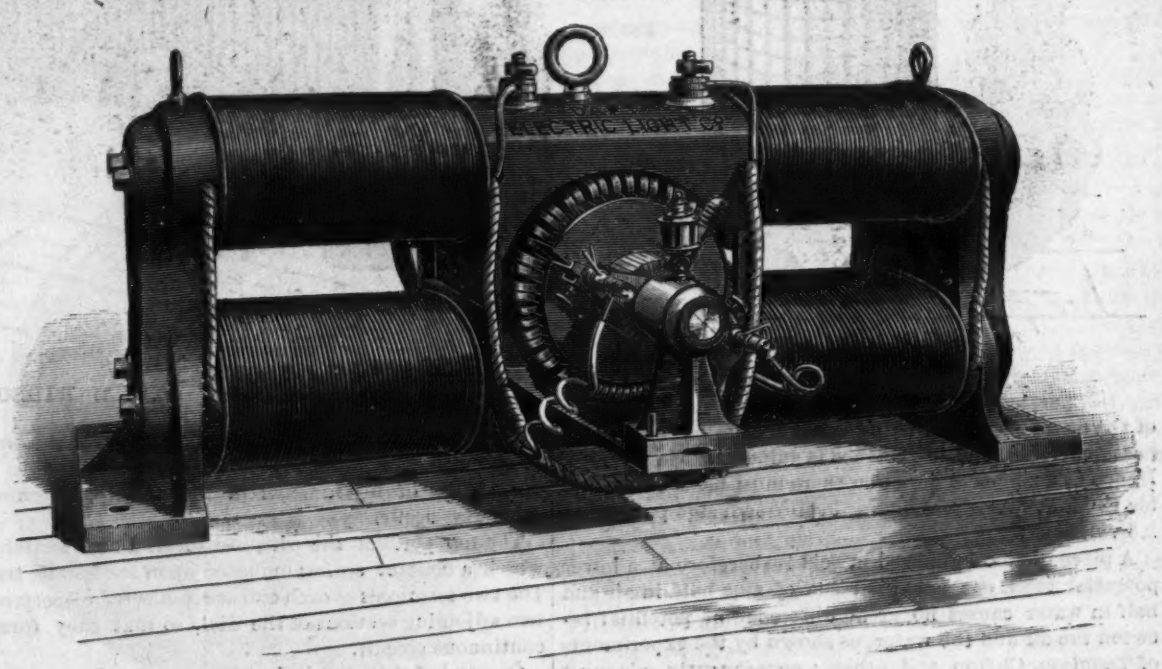



FIG. 2.—NEW DAFT GENERATOR.

## The Seat of Voltaic Electromotive Force.

At a late meeting of the British Society of Telegraph Engineers and Electricians, Prof. Oliver J. Lodge read a paper reported in *Engineering*, discussing the seat of the electromotive force in a voltaic cell. He sums up the results generally believed, as follows: (1) That there is an electromotive force at the junction of two different substances, or even of the same substance in two different states; (2) that the total E. M. F. of a circuit is the algebraic sum of all such contact forces at every junction in the circuit. To these Dr. Lodge adds a negative proposition which will command almost universal assent, namely, that if in the above two propositions, instead of the sum of the contact forces at every junction, we attend only to the contact forces at the metallic junctions, the propositions will be no longer true. The insufficiency of the metallic junctions to occasion all the E. M. F. has been demonstrated by the researches of Becquerel, De la Rive, and others, including Faraday, who gave a list of some thirty batteries which had no metallic junctions (see his

"Experimental Researches," Vol. II., p. 2,020). Another proposition which can be laid down is to the effect that the energy of the current must be maintained by chemical action, absorption of heat, or some such agent, not by mere contact.

These points being assumed, subject matter for controversy and experiment still remains in determining the relative values of the metal junctions or liquid metal contacts in producing the E. M. F. of the voltaic combination. An ordinary voltaic circuit contains at least three contacts—zinc-acid, acid-copper, copper-zinc. Which of these is the chief seat of electromotive force? Most physicists of the day, including Sir William Thomson, would probably say that the major part of the E. M. F. resides at the zinc-copper junction. Some few, including Professor Lodge, incline to believe that it resides at the zinc-acid junction. He premises that wherever a current gains or loses energy there must be a seat of E. M. F. at that place, and conversely wherever there is a seat of E. M. F. a current must lose or gain energy in passing it. Since, however, a current gains no appreciable energy in crossing from copper to zinc, it cannot be the seat of an appreciable E. M. F. On the other hand, where a current flows from zinc to acid, the energy of the combination occurring is not accounted for by the heat generated, and the balance is gained by the current. Hence at a zinc-acid junction there must be a considerable E. M. F. As a maximum, Professor Lodge puts it at 2.3 volts.

A piece of zinc immersed in acid is therefore at a lower potential than the acid; a piece of zinc half in air and half in water causes no great difference of potential between the air and the water, as shown by the experiments of Thomson, Clifton and others; consequently, air must behave much like water. If the zinc makes the air slightly positive to the water, according to Hankel's results, it may mean that the potential energy of combination of air with zinc is slightly greater than that of water with zinc, or it may represent a difference in the thermo-electric contact forces between zinc and air, and zinc and water. Again, it may depend on a contact force existing between air and water. If such a contact force exist, it may play an important part in generating atmospheric electricity. A further conclusion of Professor Lodge is to the effect that condenser methods of investigating contact force do not avoid the necessity for unknown contacts any more than electrometer or galvanometer methods. The circuit is completed by air in the one case and by metal in the other, and the E. M. F. of an air contact is "more hopelessly unknown than that of a metal contact." In fact, the only direct way of investigating contact-force is by the Peltier effect or its analogues, as pointed out by Maxwell. Lastly, Dr. Lodge concludes that zinc and copper in contact are oppositely charged, but not at very different potentials, and that the medium surrounding them is not in a uniform state; if a dialectric, it is under strain; if an electrolyte, it is conveying a current.

## Laboratory Rheostats.

One of the most essential adjuncts to the electrician's laboratory is the rheostat or resistance coil. Since the advent of machines for the production of currents of great intensity, the small rheostats formerly in use have had but little application, so that under the new order of things some more available form was desirable and necessary. The laboratory of Mr. Edward Weston, at Newark, contains two forms of rheostats which are easily manipulated and possess the advantage of portability. The first of these, shown in perspective in Fig. 1, consists of a base plate, mounted on rollers, which supports a number of rods of wood. Each of these rods, arranged as in Fig. 2, is wound double with German silver wire, as shown in Fig. 3, the wire fitting in notches made in the wood. This differential winding, which is the same as that in the resistance coils of the Wheatstone bridge, is adopted for the purpose of obviating the inductive effect of single winding upon the needles of instruments in the vicinity, which would otherwise occur.

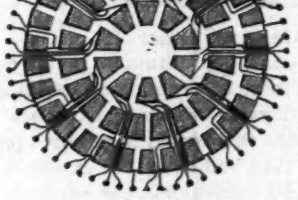


FIG. 2.

FIG. 6.

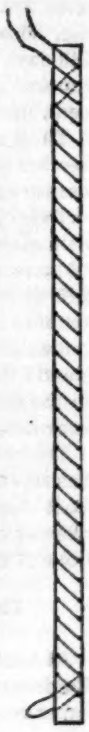


FIG. 3.

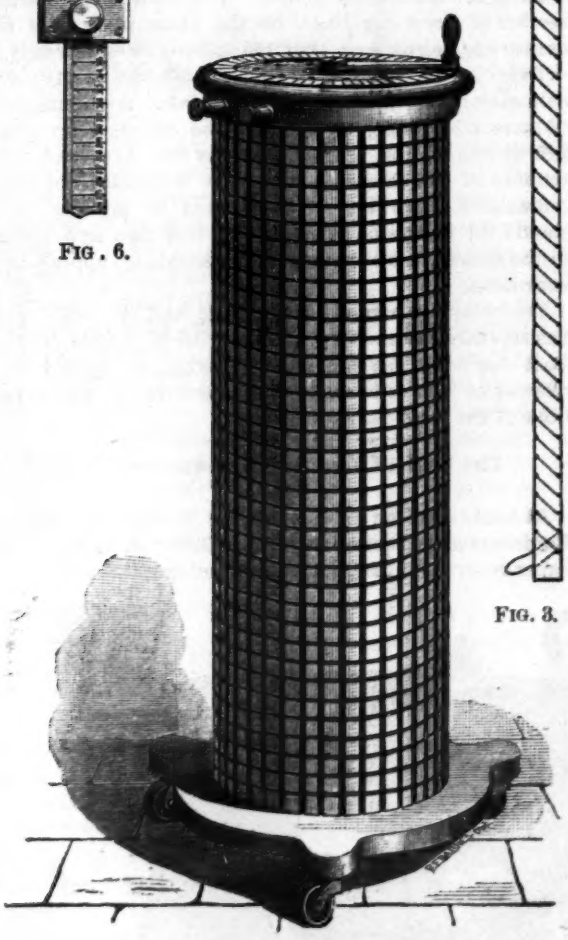


FIG. 1.—WIRE RHEOSTAT.

The top plate of the rheostat forms a dial switch over which a contact spring mounted upon the handle travels. The two terminals of each coil are connected respectively to two adjoining sections of the dial, so that they form one continuous circuit.

One end of this circuit is then connected to one of the sectors, and thence to one of the binding-posts shown, while the other ends in the adjacent dial sector. Supposing the rheostat to be connected up, if the spring contact rests upon the sector joined to the first terminal, no current will pass through the coils, but go directly through the handle and out again at the other binding-post, to which the handle is connected. If the contact be moved a section further, however, the current will be forced to pass through the coil upon one rod and then through the handle. Thus, by moving the latter, succeeding coils are brought in circuit, until finally the entire series is brought into play. The spring contact is so arranged that connection is made with one sector of the dial before leaving the other, so that no break occurs in the circuit, and consequently no spark appears.

The second form of rheostat devised by Mr. Weston is shown in Fig. 4, and allows the use of a current of 40 ampères. To pass such a heavy current evidently requires special ventilating devices, and these are secured by giving the resistance the shape of a flat ribbon which has a large radiating surface. Our illustration, Fig. 4, shows these ribbons mounted upon a movable stand and connected to sectors at the top.

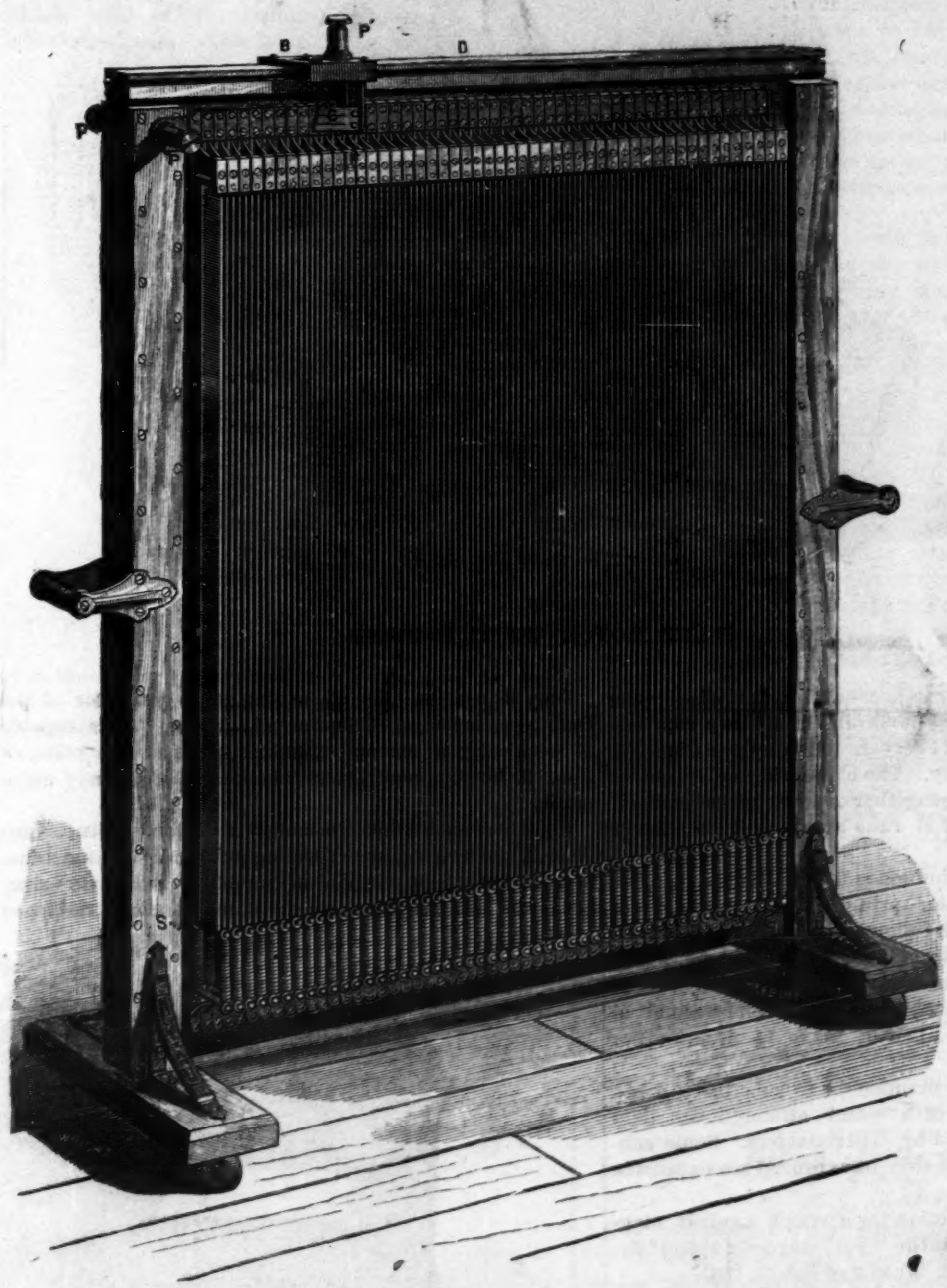



FIG. 4.—WESTON'S RIBBON RHEOSTAT.

As shown in Fig. 5, there are two sets of ribbon resistances of German silver *A*, mounted upon each side of a frame. Each of these is composed of one continuous band passing at the top over the pins *f*, and below around the pins *g*. The loops of ribbon are held taut by the insulated pins *g* attached to the ends of the springs *S*. Thus, as they heat up by the passage of the current, the expansion which takes place is taken up by the springs, and the ribbons are prevented from warping and coming in contact with each other.

Upon the top of the rheostat there is placed a scale *D*, Figs. 5 and 6, which corresponds to the ribbons on the frame. Over this scale the sliding piece *B* moves, being provided with spring contacts which pass over the strips in connection with the pins suppoting successive loops of the ribbon. A glance at the arrow *b* shows the number of the latter in use and gives a ready means of notation.

As will be seen, the rheostat is provided with three terminal screws, one *P'*, mounted on the slide, and two *P P* connected respectively to the bands. This affords a means of using the coils in three different ways. By making connections with *P'* and one of the terminals *P*, the current passes through but one ribbon, and allows the use of but half the resistance. Connecting the two ends of the circuit to the two terminals *P P*, the current passes through one ribbon, through the slide, and back through the other ribbon, so that by this means both coils can be used in series.

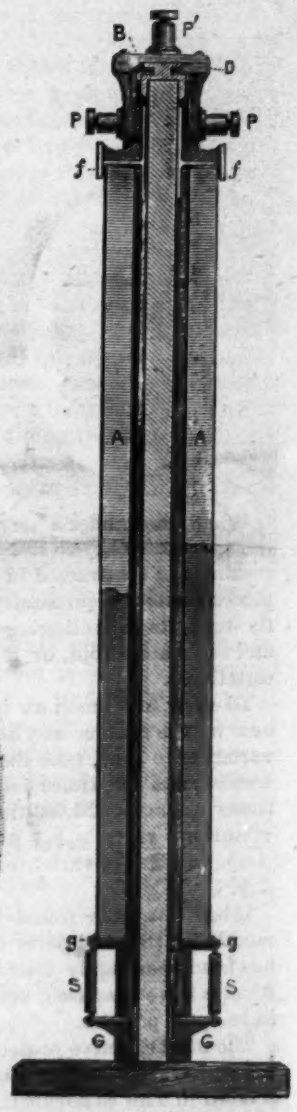



FIG. 5.

They can also be used in parallel, by connecting one end to the terminal *P'*, on the slide. By splitting the other end of the circuit and connecting the ends to the terminals *PP*, the current entering at *P'* will divide, equal portions passing through either band to the two end terminals. In this way a large number of variations can be quickly and conveniently made, while, as before stated, the apparatus permits the use of very powerful currents Like the first apparatus, this is also mounted upon rollers so that it can be shifted to any desired position.

**Domestic Electric Lighting.**—Messrs. Kauffer & Goldner have on exhibition at 51 State street, Boston, a small incandescent light run by a galvanic battery—zinc and carbon, with a liquid the nature of which is not made known. They warrant this battery to produce a light five hours each day for six weeks without replenishment, and have had for two weeks a light maintained steadily by ten cells. They state that the cost of replenishing is only 25 cents per cell.

## The New England Telephone Company.

The annual meeting of stockholders of the New England Telephone and Telegraph Company was held in New York on May 4. A number of Lowell people were represented, and quite a large number of proxies were presented. An elaborate report was read, in which the various interests of the company were considered, and facts and figures given. The following statement of Mr. Driver, the treasurer, for the nine months ending Dec. 31, 1884, was submitted:

EARNINGS.

| | | |
|---|---|---|
| Agency | $27,519.08 | |
| Exchange | 566,491.58 | |
| Extra-territorial | 47,127.88 | |
| Miscellaneous | 8,592.73 | |
| Private line | 9,311.22 | |
| Telegraph commissions | 1,314.11 | |
| Toll line | 20,830.20 | |
| Total | | $681,186.80 |

EXPENSES.

| | | |
|---|---|---|
| Damage and compensation | $10,013.34 | |
| Freight and express | 7,369.75 | |
| General expense | 52,556.98 | |
| Instrument rental | 188,051.17 | |
| Interest | 4,160.14 | |
| Messenger | 2,001.50 | |
| Miscellaneous | 11,082.31 | |
| Operating expense | 107,775.48 | |
| Postage, printing and stationery | 7,816.86 | |
| Rebate | 11,140.79 | |
| Reconstruction | 33,530.80 | |
| Repairs and maintenance | 68,883.92 | |
| Rents | 15,595.63 | |
| Total | | 519,971.02 |
| Net earnings | | $161,215.78 |

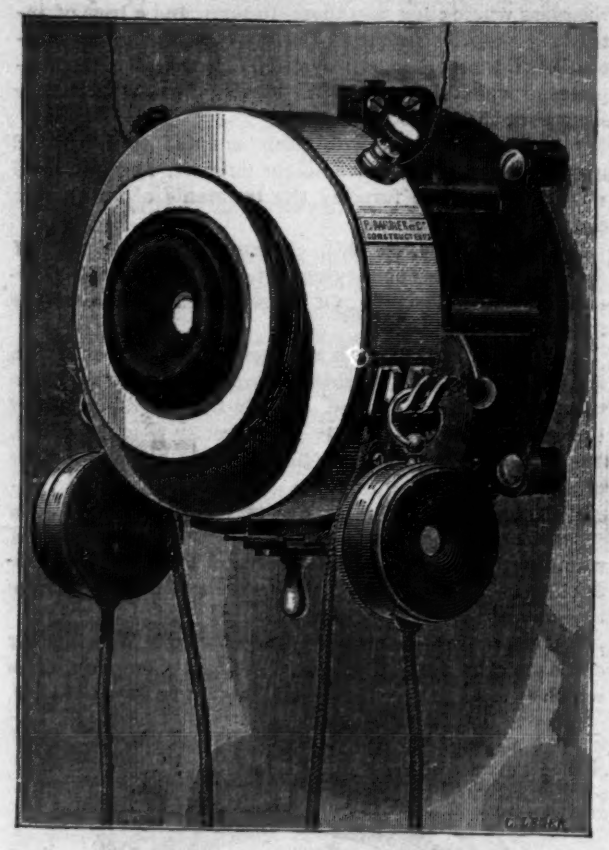


FIG. 1.—A COMPACT TELEPHONE.

CONDENSED BALANCE SHEET.

December 31, 1884.

| | Dr. | Cr. |
|---|---|---|
| Licenses | $4,268,000.00 | |
| Plant | 5,926,420.84 | |
| Unissued stock | 1,605,400.00 | |
| Trustees | 231,000.00 | |
| New construction (April 1 to Dec. 31, 1884) | 154,723.96 | |
| Office furniture, teams and tools | 13,447.36 | |
| Bells, material and supplies | 91,172.13 | |
| Accounts receivable | 120,209.89 | |
| Boston office account | 28,056.84 | |
| Cash | 11,720.52 | |
| Capital stock | | $12,000,000.00 |
| Income account | | 224,696.11 |
| Reserve | | 40,955.33 |
| Unpaid dividends | | 6.25 |
| Bills and accounts payable | | 184,452.85 |
| | $12,450,160.54 | 12,450,160.54 |

Net gain of subscribers for nine months.....758

WM. R. DRIVER, Treasurer.

There were 20 stockholders present, representing 101,636 shares—the entire issue. The yearly reports were read, as above, after which a recess was taken from 11.30 to 12 o'clock.

At noon the meeting reassembled. It was voted that the polls be kept open until 1.30. The American Bell interest intimated that it would leave the election of directors to the minority stockholders. Twelve of the persons present represented 70,000 shares. During the meeting there was a strong movement for Dr. Parker, and it was thought that if the Bell folks refrained from voting and the election were made by the minority he would be elected.

The following directors were chosen: Messrs. Vail, Forbes, Bowditch and Sherwin, of the American Bell; Ingham, Glidden, Ayer, Salisbury and Parker.

Mr. Forbes suggested that the company be strengthened by having it represented by directors residing in different parts of the territory. Following out this suggestion Messrs. Ingham, Glidden and Parker resigned, the resignations to be accepted when parties are secured to fill the vacancies.

Mr. Forbes moved as the sense of the meeting that construction be reduced to the lowest figure, with a view to resuming dividends at an early date. This motion passed, and the meeting adjourned.

## A Compact Telephone.

The telephone may be said to have assumed a permanent shape in this country, but if we are to judge by what reaches us from abroad, especially on the Continent, a change is felt to be desirable there, and will, no doubt, be soon made.

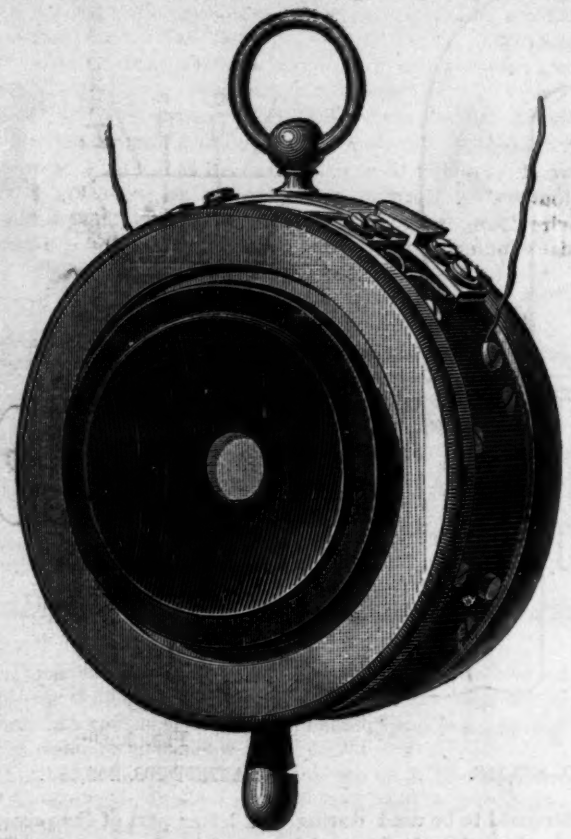


FIG. 2.—PORTABLE TELEPHONE—FRONT VIEW.

It may not be known to our readers that in Europe, for the most part, a battery call is used instead of the magneto, which we employ. This, of course, requires battery, which is used up proportionately. At the present time, in order to dispense with battery, the magneto is being substituted.

But it is proposed to go even further and to banish the battery entirely from the telephone. This necessarily brings us back to the magneto telephone, and we learn that in Berlin microphone transmitters have been taken out and magnetos of the Siemens type substituted. Here, then, we have a complete installation without any battery at all, either for calling or for conversation. This idea has been taken up by a number of French inventors, who have worked at it systematically for the purpose of getting the best results and compressing the apparatus into the smallest possible space.

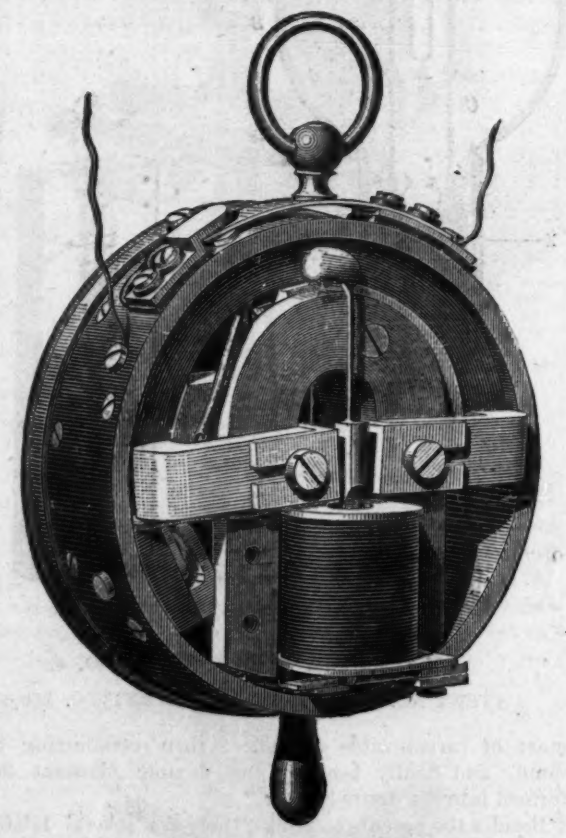


FIG. 3.—PORTABLE TELEPHONE—REAR VIEW.

Our illustration, Fig. 1, shows the latest attempt in this direction, as recorded by our contemporary, *La Lumière Electrique*. The small case contains the magneto telephone, while at the rear are the magnets and coils of the calling arrangement. Unlike our calls, this has no crank to turn. The bobbins are mounted on the end of a spring, which vibrates before two permanent magnets. The end of the spring has a small handle projecting below the case, as shown. By merely pushing this to one side and releasing it, the spring and coil are set in vibration, and alternate currents are sent over the line to the corresponding call-bell. The call-bell of the instrument itself is contained in the rear, and is sounded by an ingenious vibrator. The instrument can also be arranged so that the calling of a distant station does not ring its own bell, which may be advantageous in some situations, although as a rule, some indication of the working of the line is obtained by the sounding of the local bell. In the apparatus shown, words spoken in an ordinary tone of voice at a distance of half a yard from the transmitting end can be heard in the receiving end with remarkable distinctness and loudness. Fig. 4 shows the connections diagrammatically. Perhaps the limit of compactness in the apparatus has been reached with the portable telephone shown in Figs. 2 and 3, which are full size front and rear views respectively.

This apparatus is designed especially for military purposes, for which it seems eminently adapted. The case contains all the mechanism complete, and the rear cover constitutes the call-bell. The telephone, which acts both as transmitter and receiver, occupies the front of the case. The ring attached to the telephone has a spring connected with it which actuates the switch. Thus, when hung by the ring, the call-bell is in circuit, but when taken up the bell is cut out, and the telephone is put to the line. This is evidently the same action as that obtained with the operation of the hooked lever in our telephones with microphone transmitters.

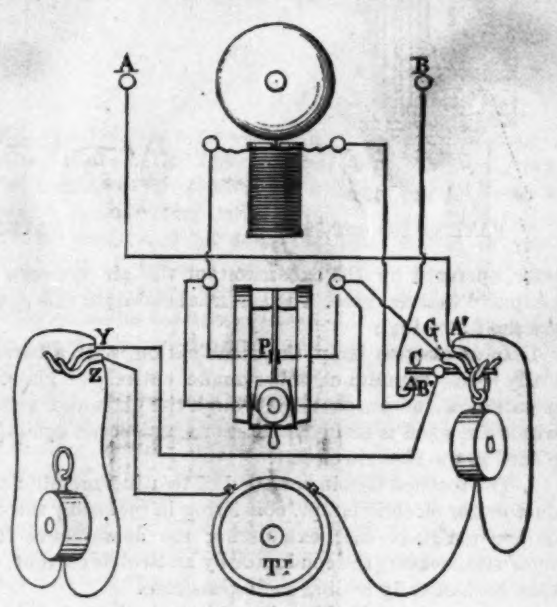



FIG. 4.—DIAGRAM OF CONNECTIONS.

For military purposes this is, no doubt, a very good form of apparatus, requiring no batteries, and only necessitating the services of a man to carry the coil of wire to constitute a connecting circuit between the reconnoitring party and the main body.

## The Incandescent Lighting Patent Suits.

As announced in our last issue, the Edison Company has instituted suits against a large number of the users of the incandescent light, as well as the manufacturers and sellers. Principal among the defendants are those who have made and used the Weston system, against whom alone nearly forty suits have been brought. Among the others are the Consolidated Electric Light Company, using the Sawyer-Man system; the Brush-Swan Company, using the Swan lamp, and the Schuyler Electric Light Company.

On the other hand, the Edison Company has been sued by the United States Electric Lighting Company for infringement of a number of its patents (which are given below) granted to Edward Weston, Moses G. Farmer and Hiram S. Maxim.

The outcome of these suits involves considerations of such eminent importance to the entire electrical interests in this country, that a short résumé of the points at issue will no doubt prove interesting to our readers.

As the substance of the suits brought by the Edison Company against all the parties is nearly identical, a statement of the complaint against one of them will be sufficient to show the points at issue.

Thus, the United States Electric Lighting Company has been proceeded against on the alleged infringement of fifteen patents, fourteen of which have been issued to T. A. Edison and one to Wm. Holtzer.

The first of these in point of date, and it may be said, in importance also, is that of Jan. 27, 1880, No. 223,898. Our illustration, Fig. 1, shows the manner in which the lamp was represented in the patent drawing. The claims are four in number, the last two of which may have no commercial value to-day. The first two, however, are of eminent importance, and are as follows:

1. An electric lamp for giving light by incandescence, consisting of a filament of carbon of high resistance, made as described, and secured to metallic wires.

2. The combination of carbon filaments with a receiver made entirely of glass and conductors passing through the glass, and from which receiver the air is exhausted.

The second patent in dispute, No. 227,229, dated May 4, 1880, relates to a lamp, the incandescent film of which was of platinum, which was gradually heated to expel the air without disintegrating the metal. This lamp has an outer glass casing, and is provided with a thermal regulator, operated by the expansion of the air between the lamp and vacuum case. The essential claims in this patent are the following:

FIG. 1.

PATENT NO. 223,898.

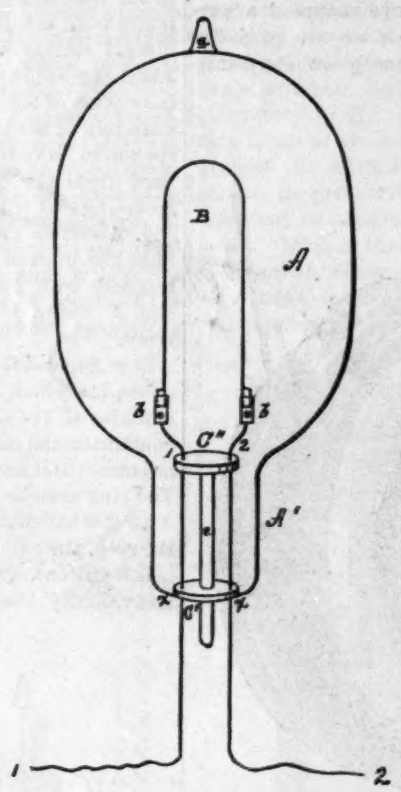



FIG. 2.

PATENT NO. 239,153.

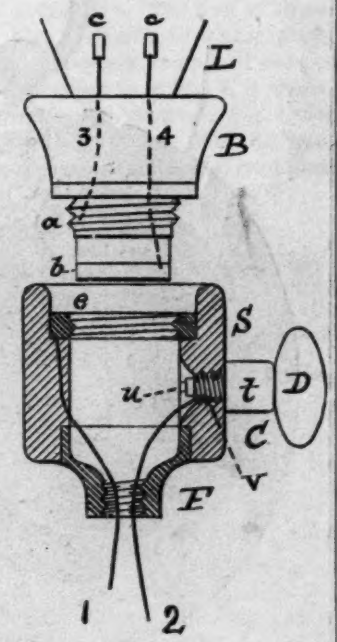



FIG. 3.

PATENT NO. 251,554.

1. In an electric lamp, the combination, with a hermetically sealed vacuum-chamber made entirely of glass, of metallic conductors passing through the glass and around which the glass is melted, and an incandescent conductor placed in the electric circuit.

2. The method herein specified of treating metallic conductors for electric lamps, consisting in inclosing the conductor in a glass case, exhausting the atmosphere from such case, heating the conductor by an electric current, and then hermetically sealing such glass case.

The next patent in the order of issue is that of July 20, 1880, No. 230,255, which relates to the method of manufacturing electric lamps. The claims contained in this patent describe the process sufficiently, and read as follows:

1. The method of forming electric lamps, consisting in separately forming the inclosing globe and the supporting bulb for the incandescent conductor, attaching the wires and incandescent conductor thereto, and then hermetically uniting the parts prior to the formation of the vacuum.

2. The method of hermetically sealing a vacuum-chamber, which consists in first sealing *in vacuo* and then sealing in air.

The next patent describes an incandescent lamp in which the bulb supporting the filament is made with a depression at the top, so that the atmospheric pressure is exerted on a convex surface. The patent, which is numbered 239,149, and dated March 22, 1881, has two claims, and they are:

1. An incandescing electric lamp, the supporting neck formed with a concavity at the point where the leading wires pass through and are sealed therein.

3. The supporting neck formed with a solid glass projection, to and upon which the inclosing globe is supported and sealed.

Six additional patents embracing methods of manufacture of lamps or filaments are included in the following order:

No. 239,153, March 22, 1881, relates to the mounting of the filament upon a support sealed to the globe, as shown in Fig. 2.

No. 248,418, Oct. 18, 1881, is a patent describing a form of filament of a continually diminishing cross-section or taper from the negative toward the positive pole. One of the claims is as follows:

"A carbon for an incandescing conductor for an electric lamp, having one of its ends or portions of less resistance and greater mass of matter than the other."

No. 266,447, Oct. 24, 1882, is a method of manufacturing incandescent lamps, which is described in the claims as follows:

"The method of manufacturing incandescent electric lamps, consisting in forming the inclosing bulb or globe directly from molten or pot glass, forming separately the supporting tube or neck for the incandescent conductor, sealing therein the leading-in wires, attaching the carbon thereto, and then hermetically uniting the parts by a welding together prior to the exhaustion of the lamp.

"A leading-in wire composed of a central platinum section for sealing into the glass an outer section and an inner section, having a clamping device formed integral therewith."

No. 265,777, Oct. 10, 1882, is a patent on a method of treating carbons. The principal claim reads:

"The method of treating the carbon filament of an incandescing electric lamp, consisting in raising such carbon filament to a higher incandescence than that at which it is designed to be used during the latter part of the process of exhausting the lamp globe, whereby the air and gas are driven from the carbon filament and from its enlarged ends and clamps, and the flexibility of such filament is increased and its shape fixed."

No. 307,029, Oct. 21, 1884, according to the claim, is a "process of forming the flexible incandescing filaments of electric lamps, consisting in first forming a straight filament of carbonizable substance, then carbonizing the same, and finally bending the flexible filament thus formed into the desired shape."

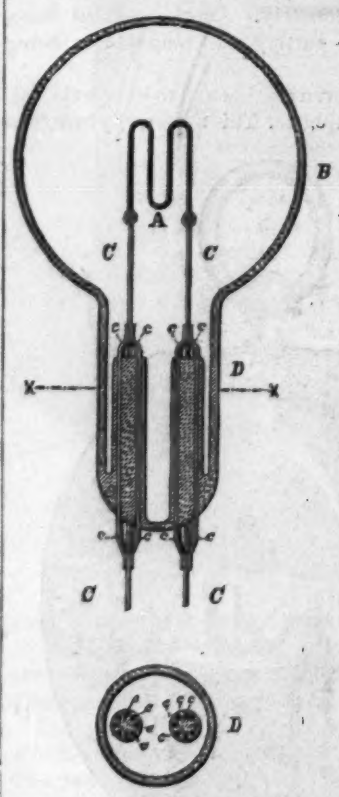



FIG. 4.

PATENT NO. 244,277.

FIG. 5.

PATENT NO. 259,614.

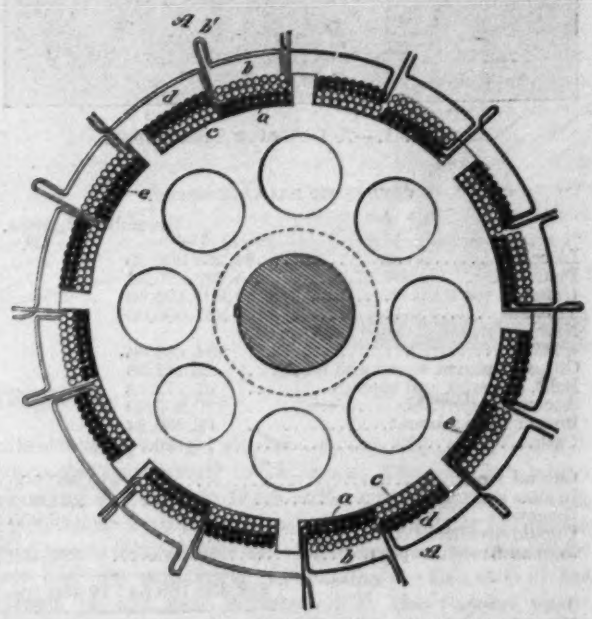



FIG. 6.

PATENT NO. 259,618.

Besides the patents on lamps, there are several relating to fixtures, lamp sockets and dynamo machines, as given below.

No. 248,424, Oct. 18, 1881, relates to the employment of a "safety catch" in the lamp circuit, and to the pendent lamp and reflector, as shown in the following claims taken from among five:

"The combination of a base-piece such as described, a lamp or chandelier standard, a safety-catch and a cap covering the base-piece.

"The combination of a pendent incandescing electric lamp and a socket to which said lamp is removably attached, with an open-flaring reflector supported by means attached to or above said socket, whereby the downward reflection of the light is uninterrupted and the lamp can be removed from and placed in said socket without disturbing the position of said shade or reflector."

No. 251,554, Dec. 27, 1881, the patent illustrated in Fig. 3, relates to the lamp-holder or socket, and is described by the following claim:

"The combination, with an incandescent electric lamp and its socket, detachable from each other and adapted to be used in a complete or round wire circuit, of controllable means for positively holding them in position together, and means for automatically completing the circuit connections between them through both limbs or members of the circuit upon placing them together in position."

The other claims of the patent are upon a device for a switch or circuit breaker.

No. 263,140, Aug. 22, 1882, the patent of T. A. Edison, relates to the brush holders of the dynamo, and the principal claim is as follows:

"In a dynamo or magneto electric machine, the combination, with the commutator, of two series of brushes (one upon each side), each brush of a series being mounted independently upon a supporting shaft or bar common to all of its series, and provided with means within itself for adjustment of pressure independently of all the others of the series."

No. 265,311, Oct. 3, 1882, describes an electric lamp and holder for the same, adapted to be placed on a gas bracket, and of the six claims we give the two following:

"A separate electric lamp, consisting essentially of an inclosing globe entirely of glass, an incandescing material secured therein, conductors leading thereto and sealed in the glass where they pass there-through, and a base of insulating material in which the neck of the globe is secured, said base being provided with metallic contact-plates to which the conductors leading into the globe are secured at their outer ends.

"A socket for an electric lamp, adapted to be placed upon a gas-pipe or other suitable support, and provided with contact-plates forming the terminals of an electric circuit."

No. 288,318, Nov. 13, 1883, embraces the regulation of dynamos by means of varying external resistance in circuit with the field coils. Of the seven claims two are as follows:

"The combination, with an electrical generator, of an adjustable resistance in addition and external to the field-magnet coils, and located directly in the field-circuit of the generator, for primarily and directly regulating and varying the strength of the field-magnet below the point of saturation.

"The combination, with a battery of generators and a separate generator supplying the field-current therefor, of means acting on the separate generator to regulate its production of current, and thereby regulate the generative capacity of the entire battery."

There remains still another patent granted to Wm. Holtzer and owned by the Edison Electric Light Company, upon which suit has been brought. This is numbered 264,498, Sept. 19, 1882, and relates to the manufacture of the electric lamp. The process consists in passing the leading wires into a tube, heating the end of the latter and then clamping the molten glass together so as to inclose the wires hermetically. This forms the base which is fused into the bulb and upon which the filament is mounted.

This, briefly stated, constitutes the ground upon which the suits have been brought by the Edison Company, but, as stated before, it has also been served with the papers in a counter suit for infringement, by the United States Electric Lighting Company. The latter's bill of complaint sets forth that seven of its patents have been appropriated by the other company. These patents were granted to H. S. Maxim, M. G. Farmer and Edward Weston, and are as follows:

No. 244,277. H. S. Maxim, July 12, 1881. Incan-

descent Electric Lamp. This patent relates to the method of leading in the platinum wires so as to leave a perfect seal. Where a large conductor is used, Maxim divides it into a number of smaller which will make good joints, as shown in Fig. 4. The claim reads as follows:

"In an electric lamp, a continuous incandescent conductor inclosed in a transparent vacuum-globe, in combination with conducting-wires leading to said conductor, each of which is divided where it passes into the globe into two or more branches, to which the material of the globe is directly sealed by fusion."

No. 252,836. M. G. Farmer, Jan. 24, 1882. Electric Lighting System. This is a method of controlling and regulating the current in an incandescent system, and three of the claims are as follows:

"In an incandescent electric lighting system, the method of uninterruptedly controlling the strength of current of a main line of continuous conductors by and correlatively with incidental variations of strength in the same current traversing a continuous branch circuit.

"In an incandescent electric lighting system, the method of varying the strength of current of a main line of continuous conductors by dynamic effects produced by variations of strength in the same current traversing a continuous branch circuit.

"The combination of a generator of electricity, two or more separate branches or derived circuits connecting the poles or main conductors of said generator, one or more electric lamps included in each of said branches, an adjustable rheostat included in that portion of the circuit of the generator common to all the lamps and mechanism, whereby the resistance of said rheostat is diminished as the joint resistance of the whole number of lamps is increased, and the reverse."

No. 253,817. Feb. 14, 1882. M. G. Farmer. Electric Light Apparatus. This is an apparatus embodying the above principle, and constitutes an automatic regulator. One claim reads as follows:

"The combination of a rheostat, mechanism for increasing or decreasing the resistance of said rheostat, an electro-magnet included in the same electric circuit with the rheostat, or in a branch thereof, and a lever for controlling the action of said mechanism, which is normally balanced between the attractive force of said electro-magnet and a constant antagonistic force, and contact-stops for limiting the motion of and determining the action of said lever."

No. 254,032. Feb. 21, 1882. H. S. Maxim. Electric Lamp. This patent relates to the manufacture of the carbon filament. The claim covers the method of gradually decreasing the section of the filament from the point of attachment to the leading-in wires to the point where incandescence begins. The object is to prevent breaking of filaments by a sudden break in continuity.

No. 259,614. June 13, 1882. Edward Weston. Safety Device for Electric Circuits. This is shown in Fig. 5 and is the "safety catch" composed of fusible alloy. Two claims read as follows:

"The combination, with a circuit or branch thereof, of a safety device which fuses at a temperature below the ignition-point of wood, paper, fabrics, or other like combustibles.

"The combination, with an electrical conductor, of a strip or wire of higher resistance than the said conductor, and which fuses at a temperature lower than the ignition-point of wood, paper, fabrics, or other like combustibles."

No. 259,618. June 13, 1882. Dynamo-Electric Machine. This is the method of winding the armature, as shown in Fig. 6. It consists in superposing the several divisions of the two systems of coils in the manner shown. The claim reads as follows:

"An armature wound with two systems of coils in diametrically separate divisions, the divisions of one system being alternately under and over those of the other, and the said divisions being looped together and connected to the commutator."

No. 277,644. May 15, 1883. Edward Weston. This patent relates to means for obviating the use of single heavy conductors for winding the armatures of dynamos of powerful current.

The invention consists in the combination, with a cylindrical core, of conductors formed of separate strands of wire or thin strips, which may be more readily bent than solid wires or bars, and which may be spread out over the ends of the core, so as to add but little to the total length of the armature. Two of the claims read as follows:

"The combination, with an armature-core, of a system of conductors composed of massed strands or strips of conducting material.

"The combination, with a cylindrical armature-core, of a system of conductors wound thereon, and composed of groups or bundles of fine wire, each group being spread out at the ends of the core."

These suits have been brought in the U. S. Circuit Court for the Southern District of New York, and will probably not be called for several months.

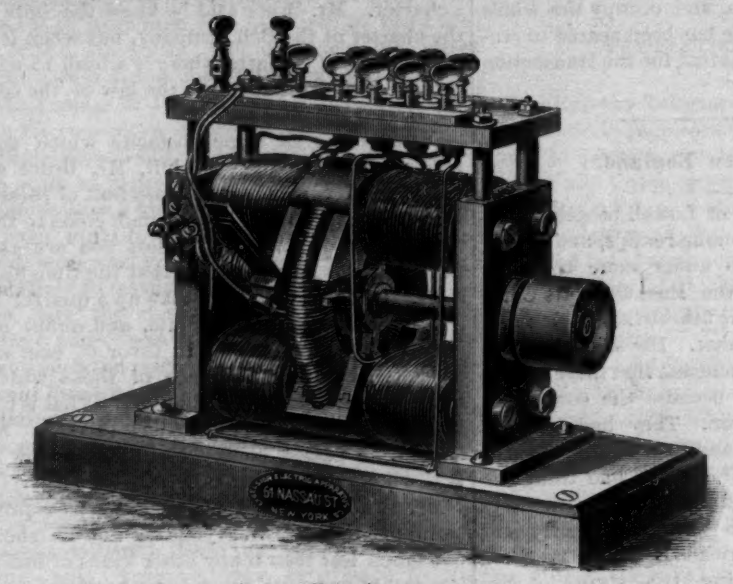



FIG. 1.

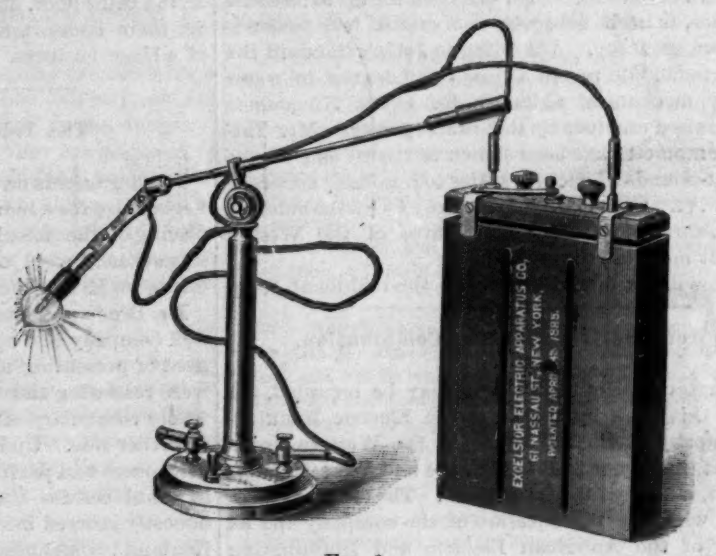



FIG. 2.

## APPARATUS FOR EXPERIMENT AND AMUSEMENT.

### New Experimental Dynamo and Pocket Battery.

In this age of electricity, when many persons are experimenting in various directions, a convenient source of electricity is a great desideratum. To meet such wants,

FIG. 3.

the little dynamo shown in the accompanying engraving, Fig. 1, has been built by the Excelsior Manufacturing Company, of 61 and 63 Nassau street, this city.

This handy little piece of apparatus weighs but 35 pounds, and occupies a space of only about one-half a cubic foot. In order to serve the different requirements under which such a dynamo would be used, it is arranged so that it can be employed either as a series or shunt-wound machine. This change is effected by means of the plugs shown on the board above the machine. The construction is substantial, and the machine is capable of delivering 450 watts under the varying conditions in which it can be worked. A special machine of similar construction is designed for electro-plating.

In addition to this dynamo, the company makes a novel pocket battery shown in Fig. 2. The ebonite case is divided into three circular compartments, each of which is lined with silver foil. To the cover three rods of zinc are attached, which dip into a solution of bisulphate of mercury contained in the cells. This compact little battery gives an electromotive force of more than 4 volts and keeps a miniature incandescent lamp aglow for a considerable length of time. Our illustration shows it put in connection with a lamp mounted upon a stand for the use of microscopists, its steady light making it especially valuable for this purpose. It can also be used for purposes of amusement, a special pin and connections being provided for that purpose. For surgeons' and dentists' use, as well as for amateurs, the arrangement shown in Fig. 3 was devised with the intention of obviating the necessity of using batteries as a source of current. The box on the table contains a small dynamo, which is worked by a treadle and generates current for a six candle-power lamp. This can be applied to illuminating the internal cavities of the body, and the machine requires no care whatever for its maintenance, being always ready for work.

To further illustrate the varied and novel uses to which these machines are adapted, it may be said that the little hand magneto, weighing only 10 pounds, furnishes current enough for a ten-candle incandescent lamp, which will be found the correct thing for fishing by the electric light.

### The Tests at Philadelphia.

Our Philadelphia correspondent sends us the following additional news in regard to the important electric lighting tests conducted there by the Franklin Institute:

At midnight on the night of Wednesday, May 6, the six-hundred-hour test of the electric lights at the Exhibition buildings, in West Philadelphia, was completed, though the comparative results of the different lights will be noted up to a thousand hours. This test, as is well known among scientists, is the outcome of the electrical exhibition held last fall under the auspices of the Franklin Institute. Mr. Tatham, the president of the Franklin Institute, is constantly in attendance, though the tests are carried on by committees chosen by the Institute and acting without pay, purely from interest in the scientific questions involved. The two principal tests are of the lights and of the dynamos. The committee on the first are Professor Marks, of the University of Pennsylvania; Lieutenant Murdock, U. S. N.; Doctor Ward, of the Philadelphia Gas Trust, and Lieutenant Duncan, of the U. S. N. On the second the committee are: Commander Jewell, U. S. N.; Lieutenant Anderson, U. S. A.; Lieutenant Murdock, U. S. N., and Professor Marks.

The different lamps undergoing the test were all guaranteed for 600 hours, and although the official report will not be made till the expiration of the 1,000 hours, the following facts were learned at the Exhibition building on Wednesday: Of the 20 lamps submitted by the United States Company 12 have gone out. The Stanley Company have lost 16 out of their 20. The Woodhouse & Rawson Company have lost 9 out of their 10; and the Edison Company 1 out of their 20. All have lost some candle-power, some more than others, but no accurate statement could be had as to the efficiency—*i. e.*, the current necessary to send through each lamp—it was found that the Weston (U. S. Co.'s) lights required 3.6 watts per candle;

the Edison 4.4, ; the Stanley, 4, and the Woodhouse & Rawson 3.8.

These figures have been looked for by scientists with only less eagerness than the result of the dynamo tests. Professor Marks said that probably no test equal to the present one for authority would ever be made, as the work was exceedingly wearisome, and no other committee was likely to bestow the same care on another test. Considering the character of the committee, this is doubtless true.

As to the dynamo test, which will begin in about two weeks, great care is exercised in the preparations. Records have already been taken for four weeks of the engine, which goes night and day. Then the dynamometer, of Mr. Tatham's invention, which has been set up to measure the dynamos, is itself subjected to a crucial test to determine its own accuracy. According to Joule's standard the dynamometer should record a rise of one degree in water heated by mechanical agitation for every 772 pounds of weight raised one foot by the same power. Mr. Tatham's dynamometer has been shown to record one degree for 770 foot-pounds of energy, being to absolute accuracy as 770 is to 772. Only six dynamos are now in the building for testing, three of the Edison and three of the Weston pattern, but more are expected.

The tests will not be finished before the middle of June.

## The New Electric Lighting Combination.

From whatever point of view it may be regarded, the occupancy this week by the American Electric Manufacturing Company of its fine offices in the Western Union building, at the corner of Fifth avenue and West Twenty-third street, is a very important event. The circumstances connected with the organization of the company and its absorption of the American Electric and Illuminating Company as well as other electrical interests, have already been given in our columns, and are therefore familiar to the electrical public. The formation of the new corporation, with a capital of $3,000,000, and with a powerful backing, is, after all, the natural outcome of the vigorous efforts that have carried the Thomson-Houston system to a front rank in the last few years ; but it marks the entrance of the management upon a far more extensive area of operations, and in the development of the aggressive policy already attended with such brilliant success, the removal from Boston to New York became a necessary step.

If the past be any criterion, expectations the most agreeable and sanguine may be formed as to the upbuilding of the company on its present basis. The rapid growth of the late company, its predecessor, forms certainly one of the most remarkable chapters in the history of electric lighting here or abroad. Beginning with a few lights in Boston in 1882—not three years ago—it had at the time of its absorption into the new concern 30 sub-companies in the United States and Canada, running about 6,000 arc lamps. It had also put in 22 isolated installations, taking 352 arc lamps ; and it had orders on hand for 1,000 lamps more. The 12 per cent. dividends paid to the stockholders had already amounted to over $130,000. The subordinate company formed in Canada has paid a dividend of 10 per cent. this year, and placed $50,000 to a surplus fund. Any one who knows how dull business has been generally, and how largely the field had been parceled out, knows that to make this remarkable headway required both great ability in the management and exceptional efficiency in the system.

This, then, is the record with which President E. H. Goff and his associates have transferred their headquarters from Boston to New York. The American light is not yet so well known in this city as it deserves ; but this is simply due to a strict observance of Goethe's maxim : "Do the thing that is next to you." The old company bent its energies, as a New England organization, on the occupation and exploitation chiefly of the New England States ; and now from the more convenient centre of New York, its successor is proposing to carry the system into every part of the country where a profitable place can be found for the electric light. One principle that has given excellent results will be tried again in this wider sphere. The proper locality being determined, the plant will be put in and lighting begun ; and then, if there is any desire on the part of the people in the locality to buy the plant, it will be sold to them on fair terms, so that it may yield a return like any other sound commercial investment. This is a plan that has hitherto answered admirably, and that ought to apply to any city or town, as it enables local capitalists to see just what it is they are buying, and enlists that local support which is so often the main element of success in new enterprises of the kind. There is no reason at all why capitalists and holders of trust funds should not be as ready to invest in working local electric light plants as in railway, gas or water stocks; and it seems to us that, as in New England, reputable bankers can be found everywhere who will handle and place good electric lighting stock, as they now do other securities generally. The number of investors in telegraph and telephone stocks to-day is very large, but ought to be matched by the number of investors interested in making the electric light a success with their capital and by their own efforts. For the sake of electric lighting, in whose grand ultimate success we have all faith, we would like to see the plan succeed.

The new company begins business not only with a large clientèle, and the prestige of the triumphs already won, but it has made a most significant and momentous move in the close alliance with the Edison Company, the basis of which is that each company shall promote the interests of the other, each helping to make a market for the other's lamps. The American arc and the Edison incandescent are a good team, and the two companies thus playing into each other's hands ought to prove formidable competitors for any other combined systems.

We are glad to find a company so important making its headquarters in New York, and can but approve its decision in that respect. The offices are in the fine new Western Union building up-town, and occupy the whole of the third floor, and no expense has been spared to render them comfortable and convenient for the transaction of a large business.

## The Telephone in New England.

The arguments on the petitions of Lowell people to the Legislature for a reduction of telephone rentals, and for the placing of the telephone business under more complete supervision, were made before the Massachusetts Committee on Mercantile Affairs on the 5th inst.

Mr. Bruce presented his argument. He said that the Bell company had come to the conclusion that there was no need of presenting any evidence, because the committee were reasoning and reasonable men. They had left the whole vocabulary of vituperation and field of prejudice to the other side. Under the guise of seeking one thing the petitioners had particularly sought another thing, namely, to annul certain contracts which have been fairly and honestly entered into by the American Bell and the New England companies. Considering the status of the telephone business, Mr. Bruce said that there are but three companies in Massachusetts; the American Bell, New England and New Bedford companies. The former has parted with all its franchises in Massachusetts to the latter two companies. There cannot be any more telephone companies in this State, and therefore the bill asked for cannot ever apply to any other but these three companies. Mr. Bruce argued that the second bill was prepared and presented simply to catch the eye. He said the Legislature of the State does not have in its keeping the interests of any one town any more than all the others, which is what the Lowell petitioners ask for. What they ask is that the New England company shall be enriched at the expense of the 1,600 stockholders in the American Bell company in the State. In regard to the claim that the American Bell company is a monopoly, Mr. Bruce said that it was a monopoly, and that every man is a monopolist who holds a patent. Not only is the American Bell company a monopoly, but also are the 5,000 skillful mechanics in Massachusetts who have produced useful inventions. To try to deprive them of their patent rights is an attack upon the constitution. The wise men who framed the constitutional measure protecting patentees saw that seventeen years, the life of a patent, was as nothing in the life of a nation. They saw that, although there was some evil in the granting of patents, it was only a temporary right, and that the good ultimately resulting was worthy of far greater consideration. Mr. Bruce referred to the first patent ever granted in the United States, to Eli Whitney, for his cotton gin, which has been largely at the basis of the wealth of Massachusetts and of the South. People at the South opposed the patent held by Whitney just the same as people are now opposing the American Bell. He read a letter written by Whitney to Robert Fulton in 1803, recounting the difficulties which he met on account of prejudices. He also read an opinion given in 1807 by Judge Johnson, of Virginia, establishing the validity of Whitney's patent just one year before its expiration. Reference was made to the action of the Georgia Legislature in 1803 in passing a resolution to ask Congress to prevent the extortionate prices which the people of Georgia might be made to pay to this monopoly. Before the gin was introduced Georgia could not produce cotton at a profit, but subsequently grew wealthy through this same cotton gin. This, Mr. Bruce argued, was a parallel to the case which the committee had under consideration. The sewing machine patents were quoted as also parallel, and showing the wisdom of the patent laws as against the unwisdom of the attack made against them. Said Mr. Bruce to the committee : "Whatever you may think of the utility of this bill, you have not the power to pass it." The United States patent laws secure absolutely to the inventor to do with his patent what he wishes. That is what the patent laws mean, and no State laws can abridge that right. The State cannot do directly what it cannot do indirectly. Therefore, if it passes a law which fixes rates for a patent which are less than it can be made for, it practically annuls the patent granted by the United States, and is therefore an unconstitutional action. In 1867 Indiana passed a law to regulate the sale of patent rights, which Judge Davis decided was void. His decision, which has never been questioned, was that a patent granted to any man gives him the rights of his patent everywhere in the United States without any interference from a separate State.

There is another provision made by the constitution which the committee must absolutely disregard before this bill can be passed, which is that no State shall pass a law impairing the obligations of a contract. This bill, which has been presented, is for the purpose of annuling the contract between the American Bell and the New England companies. The bill can have no other purpose. In regard to the desire expressed by Mr. Lilley that the committee should recommend the bill and let the courts decide upon its validity, Mr. Bruce said the Legislature did not meet for such purposes. He argued that the bill asked for was not only contrary to the constitution of the United States, but it was also contrary to the constitution of this State. By the law which was passed in this State in 1831, this Legislature has reserved the right to annul or amend a charter. Mr. Bruce said he knew the State could annul the charter of the Bell company, but when it comes to the amendment of a charter there is a limit to what the State may do, which is subject to the law of the constitution of the United States.

Disregarding all these obstacles which the committee will meet by passing this bill, Mr. Bruce said : "You must consider whether, independent of these, it is a right and wise thing to do. You cannot come to the conclusion that this bill ought to pass unless you are ready and the Legislature is ready to say that the time has come when the Legislature is ready to take up a quarrel between any two corporations in this State, and annul any contract which they have made, in favor of one, and substitute legislative contracts in place of those which have been made by the parties themselves. That is the conclusion you must come to in order to pass this bill. A like bill has never been passed in any civilized country in the world. It is wholly without precedent."

Mr. Bruce argued that, as a business proposition, the telephone business was yielding not an enormous profit, but much less than many other kinds of business of much less extent and with much less uncertainty. No subscribers had appeared to find fault with the rates, out of which no more profit is made than that which the tailor clears upon a suit of clothes. One only had appeared, Mr. McKissock, an honest Scotchman from Lowell, and he was hired to appear.

Mr. Lilley asked Mr. Bruce if he had any evidence of that fact. Mr. Bruce said, "He himself has said it."

Mr. Bruce argued that it would be unfair to cripple the telephone business, yet young, in a way which has not been imposed upon telegraph companies, long established. In regard to the proposition to place the telephone business under the control of the railroad commissioners, Mr. Bruce made a few remarks. He said the railroads were the only corporations thus placed under supervision, because they had more extensive rights, and came more directly in contact with the public. They are the only corporations which have the right of eminent domain. The telephone business does not interest the whole public, with whom it does not come in contact, but only 16,000 people in this State.

Mr. Lilley followed Mr. Bruce, and in his argument treated first the bill to regulate rentals to be charged by the American Bell company to its licensees. In discussing that bill he referred first to the character and history of the company, to the fact that the immediate predecessor of the American Bell company, the National Bell company, among its very first acts, after it was incorporated, sought to effect a combination with another monopoly, the Western Union Telegraph Company, by which it sought to gain the absolute control of the telephone business of the country, and under its contract with the Western Union Company obtained control of the Edison and Gray telephones, with a view to preventing the competition which would have resulted had these patents been available to others. This contract was made in 1879, and the American Bell company assumed it upon its formation. Then in a general way Mr. Lilley reviewed the history of the American Bell company, as well as that of the National Bell company, to show the small amounts of money actually paid in, the extraordinary privileges given to the American Bell company by the Legislature, and the vast proportions to which its business has now come. Next, he held that it was a very strong argument in favor of the bill that a great deal of the stock in the licensed companies of the Bell company in New England—all of them with few exceptions, being now merged in the New England company—is held by innocent holders, and that those persons were induced to come into these various ventures and buy stock from what they had reason to believe was the attitude of the American Bell company in all these various telephone transactions, and whether they were justified in believing that the Bell company indorsed the representations that were made at the time of the several telephone deals, as they were called, prior to the consolidation into the New England company in October, 1883, and whether they had good reason to believe that the representations that were made at the time of the consolidation were indorsed by the Bell company, might be determined by the committee from the evidence in the case. That is, it appeared from the testimony of Mr. Vail, general manager of the Bell company, that he was a director in very many of those licensed companies, representing, as he said, the Bell company, and acting under its direction and with its authority; that these various transactions, the transfer of the companies from one set of men to another, were made at the Bell office; that

the business of these various sub-companies was known to a greater or less extent by the Bell company, and the men who were most conspicuous and influential in bringing about this consolidation, and in the various transfers that were made prior to the consolidation, were, upon the testimony of Mr. Forbes and other Bell men, regarded by the Bell company with favor. Mr. Vail was general manager of the Bell company, and Mr. Madden was assistant manager. Was it strange that many supposed that the Bell company was sponsor to these various transactions? Now, while the petitioners did not ask for relief for any one man or any one set of men, the fact that so much of the stock in this company is in the hands of innocent people who were led to it by men who appeared to have the countenance of the American Bell company, and were certainly high in their favor, constituted one good reason in favor of the passage of the bill, and was proper to be considered by the committee in making up its conclusions.

In regard to the second bill, which relates to the supervision by the board of railroad commissioners of all telephone companies doing business in the State, Mr. Lilley said that no harm could come from it, so far as it appears; that it would seem certain that the power ought to be lodged in somebody to regulate the doings of these companies which have the right under the laws to use the public highways, and otherwise enjoy a great many public privileges; and if the rental charges of the American Bell Telephone Company are reduced as is contemplated by the first bill proposed, then the effect of that will soon be felt by telephone subscribers. And it would seem to be entirely safe for the public which uses the telephone, as well as the telephone companies themselves, to leave the matter of the regulation of their business in the hands of a competent tribunal, like the board of railroad commissioners, who, through long experience in the supervision of railroads, which present questions of great variety and numerous complications, are entirely able to deal with the subject. If the profits which it is claimed were fairly and honestly earned by the companies which became merged or "submerged" in the New England company, on capitals in many cases trebled or quadrupled, without the payment in of any cash or other substantial property, were actually made, he thought the telephone subscribers might well demand a reduction in rates. Here he quoted at length from Mr. Glidden's testimony to show the amount of money made by those companies, and added that if the New England company could not make money, it was because its capital had been watered under the inspiration of the American Bell company to an unconscionable figure. In the first place, cut down the tribute which the Bell exacts, then there would be a chance for the sub-companies and the subscribers to live.

In treating of the various questions of law presented by the counsel for the telephone company, Mr. Lilley claimed that it (the bill) would be no violation of the laws relating to patents, and read decisions in the following cases to prove that, while the United States patent laws give to the owner of a patent the exclusive right to his patent, and while the State cannot interfere or dictate terms upon which he shall sell or use his patent-right, yet if he makes the articles for which that patent-right is granted him, then the State can regulate the sale and the use and the terms of the sale and use of those articles: State *vs.* Telephone Company, 36 Ohio Reports, page 296; Paterson *vs.* the State of Kentucky, 97 United States, page 501; Munn *vs.* Illinois, 94 United States, page 118; Walker on Patents, chapter 7, pages 105, 106; Baltimore & Ohio Telegraph Company *vs.* American Bell Telephone Company of Missouri, United States.

Mr. Lilley said this bill does not propose to annul existing contracts, and it is not for Mr. Bruce or any one else to assume that that is its purpose. He asked, What is a fair price for a telephone? They cost, according to Mr. Vail's statement, $12 a set, and they rent for $14 a year. The company thus gets the full cost of the instruments from the first year's rental and something beside. Mr. Lilley said the sworn statement of the officials of the Ohio company, when the matter of taxation was under consideration, was that the cost of a set of instruments was only $3.35. Now the only way to get a reduction of rates is to get a reduction of the rentals. The American Bell company says that the life of the patent is short, and argue that they must make their profits while they have an opportunity, as competition will prevent their doing so after the expiration of the patent. How long, asked Mr. Lilley, do you suppose it would take the American Bell company to freeze out any other company that should attempt to start in the business at the expiration of its patent? He referred to the manner in which the Western Union Telegraph Company had crushed out all opposition. At the expiration of the patents the Bell will have the plant fully established, and will be the best equipped company in the world.

In reference to the second bill, Mr. Lilley said the telephone business had been granted valuable rights by the State, and consequently it is no more than right to place it under charge of a competent tribunal. Whether a reduction of rates to subscribers would follow a reduction of rentals, is a matter too obvious to need argument.

The chairman asked Mr. Lilley if his aim was not to benefit the public rather than any corporation.

Mr. Lilley replied that it was.

Then Mr. Bruce asked if, provided only the last bill could be reported, would he rather have that than nothing.

Mr. Lilley replied in the affirmative.

Mr. W. H. Anderson, in answer to Mr. Bruce, said he thought it would be unfair to compel the sub-companies to reduce rates to subscribers unless the American Bell reduced rentals.

An informal discussion closed the hearing.

## WESTERN NOTES.

THE ELECTRICAL WORLD BRANCH OFFICE,
CHICAGO, May 14, 1885.

The Railway Telegraph Supply Company are out with a handsome 45-page catalogue, which they will be pleased to mail to persons sending their address to the company, Fulton and Union streets, Chicago. They are prepared to furnish a full line of electrical apparatus and supplies, including telegraph, telephone and fire-alarm materials, magneto bells, annunciator burglar alarms, electric bells, dental mallets, etc. This company, by the way, has just secured a large repair job from the Western Union Telegraph Company.

The Edison miniature incandescent lamps, for use with storage or other batteries, are being handled here by the Electrical Supply Company. These lamps are adapted to house, dental and surgical, microscopical and other uses.

Mr. W. A. Hammett, of the New York Safety Steam Power Company, is just back from the East, as is also Mr. J. H. Reid, of the Electrical Supply Company.

Mr. Geo. E. Simpson, superintendent telegraph, Chicago, Milwaukee & St. Paul Railroad, spent Friday (the 8th) in Chicago.

The Sperry Electric Light Company are getting ready for an extensive plant at 103 and 105 State street. They already have seven 20-light dynamos in place, and are at present running 100 lights from the station. A chimney 125 feet high, with a capacity of 1,500 square inches, is being built, and the following engines are to be used: One 50 horse-power Ide, three 50 horse-power Westinghouse, one 60 horse-power Ogden, two 25 horse-power Payne. They will rent lights, and the capacity of the plant will be increased as the business may require. The Grannis Block fire, which inflicted a damage of nearly $10,000 on this company, does not seem to have discouraged them at all, for they are going ahead with their accustomed enterprise, and one of the finest plants in the city will soon be in operation from this station.

The Ogden engine mentioned above is the invention of Mr. Sperry, of the Sperry Company, who has devoted a good deal of time to the perfecting of an engine specially adapted to the driving of electric light apparatus. With the operation of the engine so far all are well pleased, and I am invited to see it tested in the near future, when it will be given further attention.

The Lindell Hotel, St. Louis, lately destroyed by fire, is being fully equipped with fire alarms and annunciator apparatus by the Western Electric Company.

As I expected, the extracts which I made from the Heisler Electric Light Company's catalogue, embodying the claim of this company, have caused some very pertinent questions to be propounded. It will be remembered that some statements made by this company's representative at the National Electric Convention excited a good deal of interest, and further information on this subject will be welcomed. The Heisler Company now have an opportunity to come forward and "prove up" their claims.

Commissioner Cregier has drawn up the specifications for the City Hall and tunnel Edison electric light plant. About 1,400 lights are called for—1,200 for the building and 200 for the tunnels. Four dynamos will probably be used. The contract price is about $41,000. The plant is to be in operation not later than Oct. 1.

Chicago seems to be the place at which the question of whether the bucket shops are to continue to exist will finally be settled. Suits and counter suits are now on the docket, and how the matter will come out no man can tell.

Edward H. Amet, of the Globe Electric Engineering Works, 35-41 Indiana street, Chicago, is coming to the front as an electric inventor. His electric governer for steam engines has already been described in THE ELECTRICAL WORLD. His latest invention is an electric scale. The object of this invention is to automatically weigh and make records of the weight and number of objects weighed, and to automatically deposit said records in the regular order of their production.

This electric device can be attached to any scale. It is specially designed for railways, to weigh trains of cars while in motion, and to record weights of same. On a 30-ton scale it will register within 25 lbs. of actual weight of car and contents, and will record the weights and consecutive numbers of cars weighed while they are passing over the scale at any rate of speed. It will prove of great value in the coal and mining regions, and, if it proves the success which it now seems to be, will undoubtedly be generally adopted at all the more important railway stations.

The number of the company's patent on this device is 317,432, granted May 5, 1885.

## THE TELEGRAPH.

**Railway Telegraphs.**—The Association of Railway Telegraph Superintendents will hold its third annual meeting at the Weddell House, Cleveland, O., at 10 A. M., Wednesday, June 17.

**Improved Wheatstone Transmitters.**—The English Post-Office is now issuing a new form of automatic transmitter capable of running at a speed representing 400 words per minute, 10 feet of paper passing through the instrument in 7½ seconds. The top speed of the old form of transmitter was 200 words a minute.

**Attaching Offices and Wires.**—Several attachments have been put upon the Bankers & Merchants' Telegraph Company at Newport, R. I., and the wires from that city to Fall River are attached. The Providence office of the Bankers & Merchants' Telegraph Company has been attached by the Third National Bank of New York on a claim of $50,000.

**Liability Not Limited.**—It was held by the United States Circuit Court for the District of Oregon, on April 8, in the suit of Abraham et al. against the Western Union Company, that though a person engaged in the business of telegraphy was not an insurer, and therefore not responsible for an error in a message consequent on causes beyond his control, he was, like a common carrier, a servant of the public by reason of his employment, and bound to the exercise of care and diligence adequate to the discharge of the duties thereof, and could not by any notice, regulation or contract, limit or control his liability for the negligence of himself or servants.

**The Northwestern Electric Company.**—A new company with the above name has been incorporated at St. Paul, Minn., and will be ready to do business about May 20. The incorporators and stockholders are railroad and telegraph officials. The company will do a general manufacturing and dealing business, and is understood to have a strong railroad backing. The officers are Messrs. H. C. Hope, President; R. W. Cavenaugh, Vice-President and Treasurer; James T. Clark, Secretary; Charles B. Askew, General Superintendent. These and the other gentlemen connected with the company are well known in Northwestern telegraph and railroad circles. The company will cover a good deal of territory. Its offices are in the Union Block, St. Paul.

## THE TELEPHONE.

**Newark, N. J.**—The City Council has adopted a resolution calling on the New York & New Jersey Telephone Company to remove the cables erected by them without having obtained the permission of the Council, upon the poles of the Western Union Telegraph Company, or upon any other poles or fixture of the said company.

**New Jersey.**—At Trenton, N. J., on May 4, the Court of Errors and Appeals decided to continue the injunction previously granted by that court, restraining the New York & New Jersey Telephone Company from using the Bell telephones in Newark, Harrison and Kearny, or in any way interfering with their use by the Domestic Telegraph and Telephone Company of Newark.

**Election of Officers, Mexican Central Company.**—The annual election of officers of the Mexican Central Telegraph and Telephone Co. was held on Wednesday, May 13, at the office of the company, No. 38 Wall street, this city. The result of the election was as follows: President, John W. Weed; Vice-President, George William Ballou; Secretary and Treasurer, Hammond Hunter; Directors, John W. Weed, Charles O. Morris, Hammond Hunter, and George William Ballou, of New York, and William Reed, of Boston; 38,100 shares were represented out of a total of 45,000.

**In the Argentine Republic.**—It is stated that recent experiments in long-distance telephony have been carried out in the Argentine Republic, the system being that of Van Rysselberghe. After the first few trials in Buenos Ayres itself, conversation was successfully maintained between Buenos Ayres and Belgramo, a distance of 22 kilometres (13.6 miles); between Buenos Ayres and La Plata, 70 kilometres (43.4 miles); and between Buenos Ayres and Rosario 1,350 kilometres (837 miles). These experiments, which were coincident with the *fêtes* of the foundation of the Republic of La Plata, have given most excellent results.

**The Tropical American Telephone Company.**—In 1882 this company started two exchanges in the West Indies, one at Barbadoes and later one at Trinidad. The former, after being developed to 125 subscribers, was sold to local capitalists, who organized the Barbadoes Telephone Company, Limited. After reaching 140 subscribers at Trinidad the company encountered competition, a rival system using McDonough telephones being started. The company reduced its rates, registered its English patents on the Bell and Blake instruments, and the opposition "closed up." Trinidad merchants have now purchased the company's plant and property and are developing the business. The company realizes a profit of $5,000 from the two exchanges, recovers its money invested—about $18,000—and secures permanent contracts for future supplies and instruments. There are now 200 sets at Barbadoes and 250 sets at Trinidad.

## THE ELECTRIC LIGHT.

**New Britain, Conn.**—The New Britain Schuyler Electric Light Company has been formed with a capital stock of $25,000 in 1,000 shares of $25 each.

**Mobile, Ala.**—The new Thomson-Houston plant is now in operation, running two machines, one with nineteen and the other with sixteen lights. An early increase up to the full capacity of sixty lights is expected.

**Reading, Pa.**—Mr. F. N. Boyer, who has occupied the position of chief circuit manager for the Philadelphia, Reading & Pottsville Telegraph Company at the Reading depot for over five years, has resigned his position for the purpose of accepting an appointment with the Reading Electric Light Company as their general manager.

**Temporary Electric Lighting.**—A temporary installation of electric light was made at Lady Hervey's, Hyde Park Place,

London, on the occasion of her ball. The work was carried out by the Electrical Power Storage Company. Twenty-four lamps of 20 candle-power were used, fed by 24 one horse-power E. P. S. accumulator cells placed in the area.

**Light from Afar.**—It is reported that Messrs. Francis & Co., of the Eagle Telegraph Works, Hatton-garden, E. C., London, have obtained a contract for the complete installation of electric lighting throughout the New Congress Hotel and avenue at Toronto, Can., together with electric bells and indicators to and from each apartment of the several buildings, and direct telephonic communication between the hotel and the Dominion telegraph stations.

## MISCELLANEOUS NOTES.

**Electric Foot-Warmers.**—In the car-heating system of MM. Courcelles and Elu, heat is produced by the passage of the current through a certain number of small lead plates contained in a foot-warmer, etc., of the ordinary pattern. These plates of lead are placed according to the length of the foot-warmer, and are all in derivation upon two conductors of iron wire, which carry the current. In such case the heat is found to be distributed in a uniform manner. In some experiments with the current produced by a Gramme machine traversing in series five foot-warmers, of which the dimensions were 0.22 m. long, 0.05 m. thick and 1.80 m. length, each case containing 45 plates of lead, the five cases are found to be sufficient for the heating of one carriage. The current was 24 ampères, with a difference of potential of 50 volts at the terminals, and the energy dispensed was 150 kilogrammetres, or more than a horse-power and a half. From these figures it may be seen that with a train composed of several carriages this mode of heating requires a considerable amount of power, and the adoption of such a system would entail an expense which few railway companies will probably be disposed to incur

## STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

**Telegraph.**—Am. Cable, b 57¼, a 58; Am. Dist. Tel., b 15, a 20; B. & M., b 2, a 3; Postal stock, b 1½, a 2; Postal sixes, b 14; Western Union, b 58⅝, a 58½.

**Telephone.**—Am. Bell, b 198, a 200; Erie, b 20⅛, a 20¾; Mexican, b 1¼; New England, b 33, a 34.

The Boston *Herald* of May 10 says:

Bell Telephone rose to 201 and reacted to 199, with the rights at 2@2.02½. It appears that the selling of rights was the principal cause of the late decline in the stock. The sale of rights ceases to-day.

New England Telephone was stronger at 32@35. The resignations of Messrs. William A. Ingham, Charles J. Glidden and Moses G. Parker, Lowell directors, have been accepted, and the two latter re-elected. Mr. Henry D. Hyde, of Springfield, has been chosen in Mr. Ingham's place. The board has reorganized by the re-election of President Vail and Treasurer Driver, and by the choice of Mr. F. J. Boynton as secretary.

**Electric Light.**—Edison, b 60.

## BUSINESS NOTICES.

**Early Telephony.**—All persons who experimented with or used the Reis telephone before the year 1876 will please send their address to Briesen & Steele, 229 Broadway, New York.

**Anti-Magnetic Shields for Watches.**—These shields, made by Giles Brothers & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches which are already affected.

**Carbon "Points."**—Messrs. Holmes, Booth & Haydens, of Park place and Murray street, this city, are the sole agents for the Forest City Carbon Manufacturing Company, of Cleveland, O. The carbons manufactured by this company are said to be, by actual test, 98 per cent. of carbon. They have a very high conductivity, give a steady, clear white light, and are considered a very superior carbon by those who have tried them. Before assuming the agency, the firm satisfied itself thoroughly as to the excellence of the article, and it is now prepared to fill the largest orders.

# OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

### PATENTS DATED APRIL 28, 1885.

**Electric Battery**; Ernest Bazin, Paris, France, 316,436 and 316,437

1. Imparts a rotary motion to the zinc and carbon elements.
2. Provides a commutator of mercury in the above broad invention.

**Electric Wire Insulator**; Joseph Locke and William Bowker, Medford, Assignors by mesne assignments to themselves and Robert Williams, Boston, Mass..... 316,469

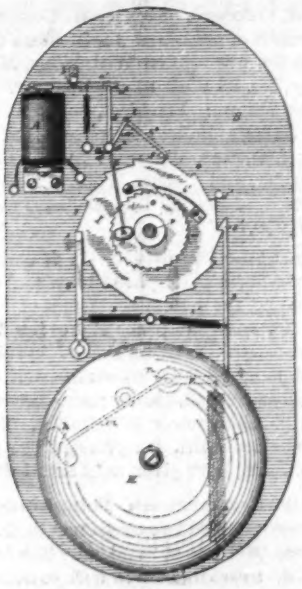
A glass insulator is provided at each end with two sets of grooves, arranged to contain the wire and to attach the insulator to a support.

**Fire Telegraph System and Apparatus Therefor**; Lewis H. McCullough, Richmond, Ind., Assignor to the Richmond Fire Alarm Co., of same place, 316,474, 316,475, 316,476 and 316,477

1. In an open circuit, two or more circuit closers are connected in two directions, with each pole of the generator.
2. Each circuit runs from one pole back to same pole respectively, and the circuit closers are in multiple arc thereto.
3. An independently-driven gong-striking mechanism is connected to the ratchet, as shown in the cut.
4. An exhausted tube surrounds the contact points for preventing atmospheric actions and admission of dust.

**Printing Telegraph**; A. Buttles Smith, Brooklyn, N. Y., Assignor to William B. Rankine and Benjamin W. Franklin, of same place..... 316,494

In the periphery of the type wheels the individual types are placed upon spring supports to move independently of the type wheels.



316,476. ELECTRO-MECHANICAL GONG STRIKER.

1. **Governor for Electric Motors**..... 316,500
2. **Automatic Cut-out for Incandescent Lamps**. 316,501
3. **Electric Cut-out**..... 316,502

William M. Thomas, Assignor of one-half to Grand Rapids Electric Light & Power Co., Grand Rapids, Mich.

1. The vibrating governor by its own momentum of vibration checks the motion of the machine.
2. The filament is arranged in sections, and each section is connected up with a differentially wound magnet.
3. The cut-out armature floats in a liquid.

**Primary and Secondary Battery**; George Tournier, Paris, France..... 316,533

The metallic oxides are mixed with glycerine.

**Electric Burglar Alarm**; John Hill, Long Island City, and Joseph E. Babcock, New York, N. Y..... 316,621

The magnet core and the bell are connected by a short circuiting wire, and the armature is connected to the line wire. The result is a continuous ringing of the electric bell.

**Electric Lighting System**; Edward Weston, Newark, N. J., Assignor to the United States Electric Light Co., New York, N. Y.....316,707, 316,708 and 316,709

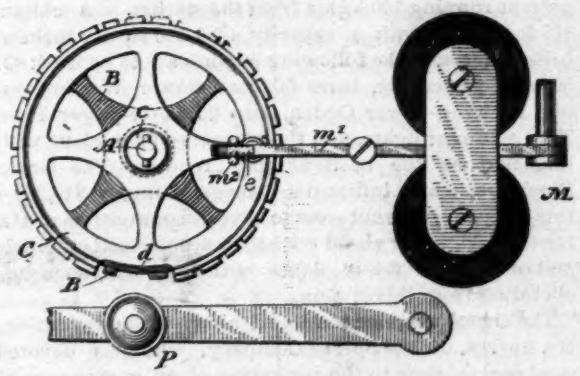
1. A circuit controller is arranged to complete the main circuit when the electromotive force of the machine has reached a certain degree.
2. A shunt of low resistance around the divisions of the general circuit is provided, together with devices for controlling the shunt of low resistance.
3. Employs with each group of lamps a supplemental circuit containing an electro-magnetic circuit controller, and having as many breaks as there are lamps in the group.

**Thermostat**; James L. Campbell, West Elizabeth, Pa. 316,738

The heat-bar is of wood, on each side of which are two bands of differently expansible material.

**Synchronous Telegraphy for Fac-simile Transmission**; Patrick B. Delany, New York, N. Y., Assignor to the Standard Multiplex Telegraph Co., of same place..... 316,754

He employs combs containing twelve fingers (more or less) at each station in connection with a single main line, by which are transmitted fac-simile impressions. The system for transmission of independent impulses is that for which he has heretofore obtained patents.




316,690. UNISONING PRINTING TELEGRAPHS.

**Electric Arc Lamp**; Moses G. Farmer, New York, N. Y..... 316,765

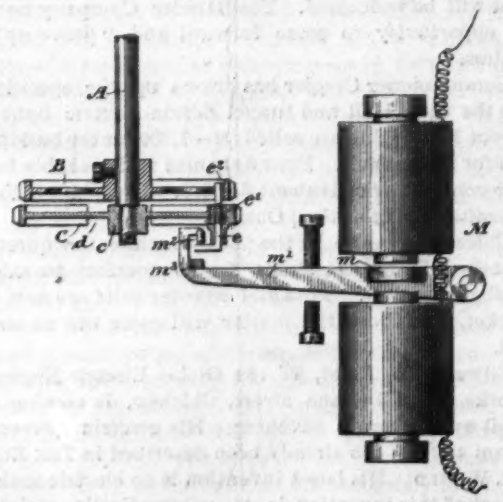
Combines a Thomson electrometer in the shunt about the arc for controlling the operations of the lamp electro-magnetic mechanism, as shown in the cut.

**Electric Arc Lamp**; William W. King, St. Louis, Mo., Assignor of one-half to William Somerville, of same place..... 316,791

The two dash pots are placed at right angles to each other in order to obtain an even downward motion of the carbon holder.

**Telegraph Insulator**; John O'Brien, New York, N. Y., Assignor to William Brookfield, of same place..... 316 812

Upon the side of a glass insulator a hole is provided having a groove leading thereto, the hole and groove being at an angle to each other.




316,690. UNISONING PRINTING TELEGRAPHS.

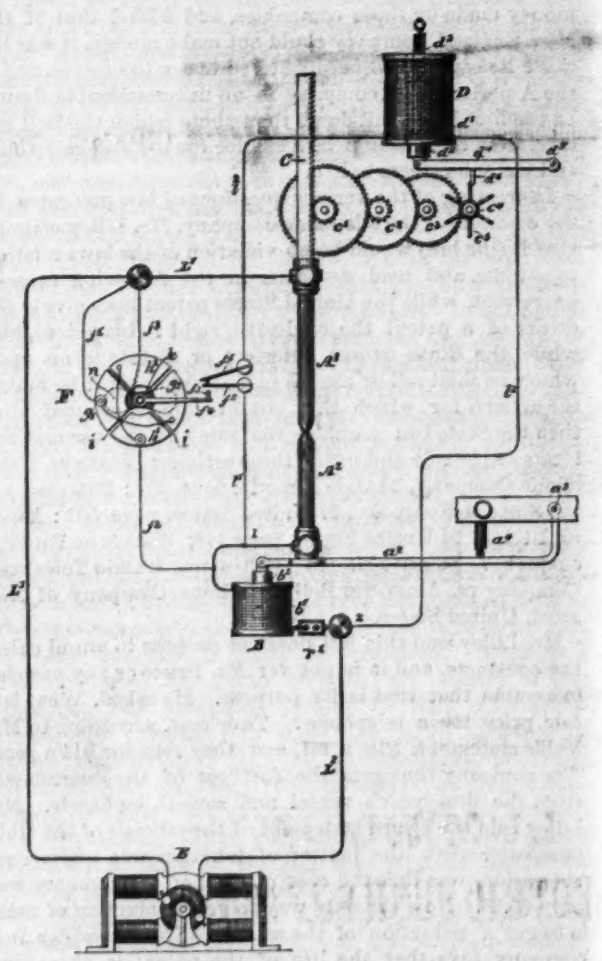
**Telephones and Induction Coils**; Thomas J. Perrin, Brooklyn, N. Y., Assignor by mesne assignments to the National Improved Telephone Co., New Orleans, La..... 316,816, 316,817 and 316,818

1. The mouth-piece of a transmitter is mounted upon one end of a permanent horseshoe magnet and an electro-magnet upon the other.
2. The alternate layers of wire in an induction coil are secondary and independent primary coils.
3. The carrier of one electrode in a telephone is mounted upon a coil spring, the carrier being made of rubber.

**Printing Telegraph**; Henry Van Hovenbergh, Elizabeth, N. J., Assignor to Baltimore & Ohio Telegraph Co., Baltimore, Md., 316,676 to 316,698 inclusive, and..... 316,855

These twenty-four patents include the transmitter, the receiver, both chemical and mechanical, as well as two or three general methods of transmitting printing telegraphically. The principal method consists in moving a type wheel transversely across the page upon which the impressions are to be made, revolving the type wheel in each of a series of positions which it is thus caused to successively occupy for bringing the desired type before the paper, and impelling the type wheel against the paper in each of these positions.

Another method is thus described briefly by reference to the accompanying cut, showing a side view and top sectional view respectively; it consists in applying to the movable type-wheel or segment a locking-pin which is adapted to enter an aperture formed in the rigid type-wheel, thereby coupling the two wheels together. An electro-magnet is provided for withdrawing this coupling-pin from the rigid type-wheel and holding the loosely mounted type-wheel in a given position while impressions are being taken from the other type-wheel. When the armature-lever of this magnet is in a given position, the locking-pin will, by striking against the lever, cause the arrest of that type-wheel at its unison-point. If, therefore, the two type-wheels be locked together, both type-wheels will be arrested at unison. The chemical instrument involves the principle of effecting chemical impressions upon different type-wheels by currents of different directions.




316,765. ARC LAMP.

Another important invention embraces a means of storing energy for operating the transmitting device, and consists of a combination of levers, bellows, springs and weights operating jointly to produce the desired effect. The several patents cover over seventy-five pages of drawings and printed matter, so that it is impossible to do them justice in the small space at our disposal.

**Telephone Transmitter**; George W. Drawbaugh, Eberly Mills, Pa., Assignor to the People's Telephone Co., New York, N. Y..... 316,883

One carbon electrode leans upon the diaphragm, and the other carbon electrode leans upon the first.

**Telephone Transmitter**; J. E. Fuller, Chicago, Ill. 316,888

One electrode is supported upon the end of a lever opposite the other electrode, which is upon the end of a spring lever. The first lever abuts against the diaphragm.

**Telephone Exchange System**; William H. Preece, London, England..... 316,911

An indicator is so placed in a leak branch that the operator at the exchange knows when the conversation has ceased.